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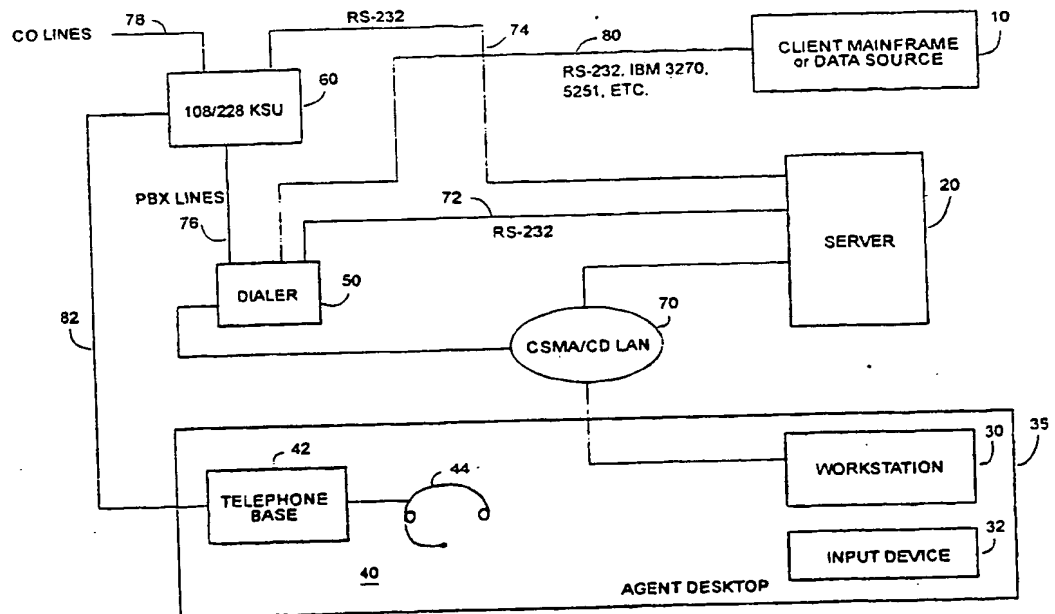
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(21) International Application Number: PCT/US94/10516 (22) International Filing Date: 16 September 1994 (16.09.94) (30) Priority Data: 08/123,309 17 September 1993 (17.09.93) US (71) Applicant (for all designated States except US): EXECUTONE INFORMATION SYSTEMS, INC. [US/US]; 478 Wheelers Farms Road, Milford, CT 06460 (US). (72) Inventors; and (75) Inventors/Applicants (for US only): RAMOT, Danny [IL/US]; 191 Lamplighter Lane, Fairfield, CT 06430 (US). BLAMEY, Jeffrey, L. [US/US]; 33 David Drive, Wallingford, CT 06492 (US). (74) Agents: BARRESE, Rocco, S. et al.; Dilworth & Barrese, 333 Earle Ovington Boulevard, Uniondale, NY 11553 (US).	(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FL, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD). Published <i>Without international search report and to be republished upon receipt of that report.</i>	

(54) Title: **APPARATUS AND METHOD FOR DYNAMIC INBOUND/OUTBOUND CALL MANAGEMENT AND FOR SCHEDULING APPOINTMENTS**

(57) Abstract

A telephone system provides dynamic inbound/outbound call management for a telemarketing campaign to automatically initiate outbound telephone calls for outbound agents, with outbound agents redesignated as inbound agents to answer inbound calls as needed according to at least one threshold of number or duration of waiting calls or number or duration of waiting inbound agents. Each agent's work area (35) includes a telephone station (40) having a display (30) and an input device (32). The telephone stations (40) are coupled to a server (20) via a network, and the telephone system includes appointment and calendar functions with pop-up menus.

The server (20) is also coupled to an automatic dialer (50) and to a private branch exchange (60). When the server (20) assigns an outbound call to an outbound agent, the server sends information about the party called to the outbound agent's telephone station for all display simultaneous with connecting the called party to the outbound agent. The telephone system allows each agent to control all telephone functions through the telephone station using the display (30) and input device (32). Each agent may dial and control additional calls using the input device (32), including central office calls, intercom calls and paging. As each outbound call is initiated or completed, system parameters are adjusted to maintain a predetermined minimum number of busy outbound agents. The adjustments also maintain the percentage of unattended outbound calls for which no outbound agent is available.



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1 **APPARATUS AND METHOD FOR DYNAMIC
INBOUND/OUTBOUND CALL MANAGEMENT
AND FOR SCHEDULING APPOINTMENTS**

5 **CROSS REFERENCE TO RELATED APPLICATIONS**

 This application is a continuation-in-part of U.S.
patent application entitled APPARATUS AND A METHOD FOR
PREDICTIVE CALL DIALING having Serial No. 07/774,600, filed
October 10, 1991.

10 **FIELD OF THE INVENTION**

 This invention relates generally to telephone
systems, and particularly to a dynamic call management
15 system and method for use in an inbound/outbound predictive
dialing telemarketing environment.

BACKGROUND INFORMATION

20 Predictive dialing is a technique for scheduling
the dialing of calls to provide an answered call almost
immediately after an agent becomes available from servicing
a previous call.

 Predictive dialing systems have found increased
25 applications in automated dialing systems of telephone data
collection networks to enhance productivity in telemarketing
environments; for example in business, and political and
charitable telemarketing campaigns. Using queue and
waiting-line models of inbound and outbound calls,
30 predictive dialing systems allow telemarketing agents to

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1 address more outbound calls dialed by an automated dialer
with greater efficiency, allowing the telemarketing agents
to increase the number of successfully served customer
contacts, and therefore to increase the success of the
5 telemarketing campaign.

Automated dialing systems eliminate some
unproductive uses of the agents' time. In automated dialing
systems, telephone numbers are dialed under control of one
or more computers, and the automated dialing systems
10 recognize rings, busy signals and answers. Automated
dialing systems may also detect whether each agent is
currently engaged in a call, or is available. A call is not
transferred to an agent until an answer is detected by the
system and the agent is available. The agents are thus
15 provided with a steady stream of answered calls. Automated
dialing ensures uniform coverage within the range of
telephone numbers targeted.

In order to maximize the number of calls each
agent services, an automated dialing system may incorporate
20 a predictive dialing system to dial an outbound call and
detect that the call has been answered before an outbound
agent is available, thus maximizing an outbound agent's
contact with a greater number of potential customers.

Systems using predictive dialing techniques which
25 provide for agents to serve only as outbound agents for
addressing automated dialed outbound calls, or only as
inbound agents for answering inbound calls suffer from
drawbacks such as allowing inbound calls to divert or
interrupt outbound agents from addressing outbound calls,
30 thus reducing the efficiency of the automated dialing
system; or resulting in the neglect or ignoring of the

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1 inbound calls by the outbound agents. Typically, outbound
agents had to manually logoff or signoff from the outbound
agents' computer workstations to answer inbound calls or to
manually logoff from an outbound computer system in order to
5 manually logon to an inbound computer system.

The efficiency and success of telemarketing
campaigns depend upon contacting and bringing in as many
people as possible to contribute to or to buy from the
telemarketing campaign. For example, blood drive campaigns
10 rely upon obtaining people to make appointments to arrive at
specific blood drive locations to give blood. The
advantageous uses of automated appointment and calendar
features and functions by both inbound and outbound agents
increases the efficiency and success of the telemarketing
15 campaign.

Therefore, it would be advantageous to increase
the efficiency of the agents to access a calendar and to
make appointments through the use of pull-down or pop-up
menus as well as through windows overlapping current
20 workstation display screens. In addition, the use of
function keys or preassigned keystrokes to an input device,
such as a keyboard, a mouse, or a handset, to bring up or
generate specialized display screens for displaying a
calendar and available dates and time slots increases the
25 efficiency of agents to make and save appointments.

A predictive dialing system having a calendar
function is described in U.S. patent application entitled
APPARATUS AND A METHOD FOR PREDICTIVE CALL DIALING having
Serial No. 07/774,600, filed October 10, 1991, which is
30 incorporated herein by reference.

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1 It would also be more efficient for a predictive
dialing system to automatically display the party
information on an outbound agent's display on a specialized
display screen substantially simultaneous with the
5 connecting of the outbound agent to the intended party. An
additional advantage would be to have such preexisting party
information automatically transferred by the automated
dialing system to appointment screens on an outbound agent's
display upon access by the outbound agent to the appointment
10 functions, thus avoiding the outbound agents having to
manually enter the party information which the automatic
dialing system already possesses.

SUMMARY OF THE INVENTION

15 The present invention is embodied as a telephone
system comprising a server and a data source for use as a
predictive dialing system including a dialer for
automatically dialing telephone calls, a private branch
20 exchange (PBX) connected to a plurality of telephone
stations, with each telephone station assigned to one of a
plurality of agents. The data source includes a dialer
database for storing telephone numbers and client
information to be dialed, and an appointment database for
25 storing appointment information. The server has a
processing unit, associated memory, and stored programs with
the processing unit including designating means for
designating agents as either inbound agents or outbound
agents, detecting means for detecting that one of the agents
30 is available to answer a call, assigning means for assigning
and connecting a call to an available agent, queue means for

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1 generating queues of calls and agents, threshold means for
detecting when a queue exceeds at least one threshold, and
access means for controlling access of an agent to the
telephone system to log the agent on or off the telephone
5 system. The associated memory includes agent, dialer, and
appointment databases, a call queue, and an agent queue.
Each telephone station includes an input device, a display,
a processor, and a buffer. The processor controls the
telephone station, and each telephone station provides full
10 telephone keypad functionality for dialing outbound calls
and for recording data gathered from called parties,
allowing an agent to focus attention more productively on
conversing with customers and recording data.

The present invention provides additional
15 functions for agents to schedule appointments with the
parties called; for example, telephone campaigns to schedule
blood donation appointments. The processor of each
telephone station includes means for generating and changing
appointment information and for generating a calendar using
20 a calendar function. The calendar function is provided to
display the dates for which appointments are available.
Once a date is selected and entered into the telephone
station, the available time slots are automatically
displayed. The calendar function automatically updates the
25 appointment database of remaining available appointments
with each appointment scheduled.

Agent productivity is further enhanced by improved
scheduling methods. The rate and time at which outbound
calls are dialed closely tracks the rate and times at which
30 outbound agents become available to respond to the outbound
calls.

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1 The telephone system uses predictive dialing
techniques to provide optimal call scheduling with
alternative methods for responding to outbound calls which
are completed before an outbound agent is available. A
5 system administrator may choose to immediately terminate
these calls, or to play a recording until an outbound agent
becomes available. The system administrator may also
configure the telephone system and adjust the scheduling
rate to reduce the occurrence of these unattended outbound
10 calls to the level desired.

BRIEF DESCRIPTION OF THE DRAWINGS

 The features of the present invention will become
15 more readily apparent and may be better understood by
referring to the following detailed description of an
illustrative embodiment of the present invention, taken in
conjunction with the accompanying drawings, where:

 FIGURE 1 is a block diagram showing the hardware
20 components of the predictive dialing system.

 FIGURES 1a through 1c are screen format diagrams
which illustrate scheduling means that may be displayed on
the display device of the system shown in FIGURE 1.

 FIGURES 2 and 2a are flow chart diagrams for the
25 scheduling method used in the system shown in FIGURE 1, when
unattended calls are placed on hold till an operator is
available.

 FIGURES 3 and 3a are flow chart diagrams for the
scheduling method used in the system shown in FIGURE 1, when
30 unattended calls are immediately dropped.

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1 FIG. 4 shows an activity selection screen;
 FIG. 5 shows an agent working screen;
 FIGS. 6A-6B show a flowchart of a method for
making an appointment using calendar and appointment
5 functions;
 FIG. 7 shows a flowchart of a method for
controlling a campaign using the present invention;
 FIG. 8 shows an outbound call processing routine;
 FIG. 9 shows an inbound call processing routine;
10 FIG. 10 illustrates a conversion threshold
detection routines used in the inbound call processing
routine;
 FIG. 11 shows a Campaign Parameter Profile screen;
 FIG. 12 shows an Agent Profile screen; and
15 FIG. 13 shows a Dynamic Screen Profile Edit
screen.

DETAILED DESCRIPTION OF THE EXEMPLARY EMBODIMENT

20 Referring now in specific detail to the drawings,
with like reference numerals identifying similar or
identical elements, the following is a description of an
exemplary automated dialing system in accordance with the
present invention.

25 FIGURE 1 shows a block diagram of a hardware
configuration operating the predictive dialing system. The
system serves a plurality of agents who may be employed in
telemarketing, charity campaigns, political canvassing,
surveys, debt collection, or other activity requiring a
30 large number of direct telephone calls to the public. Each
agent has a work area such as desktop 35. The desktop

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1 includes a computer video display terminal 30 and an input
device 32, such as a mouse or a keyboard. Although the
invention can be implemented using a fixed function display
terminal or personal computer, an intelligent workstation
5 (e.g., an IBM AT compatible personal computer having an
Intel 80386 microprocessor and operating under control of
the Xenix 386 operating system) is used in the exemplary
embodiment. The agent desktop 35 also includes a digital
telephone set 40 including at least a base 42 and a headset
10 44. The telephone set 40 can be single line, multikey, or
multikey with a display.

The agent workstations 30 are connected to a
server computer 20 (e.g., a computer identical to one of the
workstation computers) via a standard Local Area Network
15 (LAN) 70 protocol, such as Carrier Sense Multiple Access
with Collision Detection (CSMA/CD) protocol. Other server
computers and LAN protocols are also contemplated for the
predictive dialing system.

In addition to the LAN interface, the server
20 computer 20 is connected to an automatic dialer 40 for
example, an Infostar dialer available from Executone
Information Systems, Inc., via a standard RS-232 interface
72 and to a private branch exchange (PBX) 60, which may be,
for example, a Key Set Unit (KSU) such as the ISOETEC
25 108/228 communications processor also available from
Executone Information Systems Inc. The automatic dialer 50
is connected to PBX 60 by lines 76, and controls the PBX.
It provides the digital dialing input to the PBX 60 and
monitors the calls, providing server computer 20 with call
30 status. In particular automatic dialer 50 notifies server

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1 20 when line busy, ring-no-answer, and live-call status are detected.

In addition to the automatic dialer 50, the PBX 60 interfaces to a plurality of agent telephones 40 having
5 bases 42 and headsets 44 and to Central Office (CO) lines 78. The PBX 60 produces the Dual Tone Multifrequency (DTMF) signal required to initiate a call on the CO lines, in response to signals provided by the automatic dialer 50 over lines 76.

10 The server computer 20 receives a daily download of target telephone numbers and appointment data at the beginning of each day, from a data source computer 10, such as a mainframe or mid-sized computer. These telephone numbers are stored in the server computer so that no further
15 interactions between the server 20 and the data source computer 10 are required for the remainder of the business day. At the end of the business day, the server computer 20 uploads a record of the day's activity back to the data source computer 10. In the exemplary embodiment, it is not
20 necessary to provide a direct communications link between the server computer 20 and the data source computer 10. The automatic dialer 50 includes the hardware or firmware needed to do protocol conversion between the server protocol 72 and the data source computer protocol 80.

25 In this configuration, the dialer 50 provides the interface between the server 20 and the agent's mainframe computer 10. This is appropriate since the dialer 50 is only used as an interface to transfer data between the mainframe computer 10 and the server 20 at the start or end
30 of a campaign, that is to say, when its dialer functions are not being used. Alternatively, a direct connection may be

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1 established between the mainframe computer 10 and the server
20.

The typical method of operation of the system is described in the following paragraphs. The data is
5 downloaded from the data source 10 to the server 20 for one or more campaigns. The agents who have logged in for the day are each assigned a campaign attribute in the server's database, so that each agent will only be assigned calls from a single campaign. The server 20 sorts the telephone
10 numbers it receives into campaigns and transmits these numbers, one per call, to the automatic dialer 50. The dialer dials the number, providing an output signal over lines 76, which is translated into DTMF tones by PBX 60. The DTMF tones initiate a connection over the central office
15 lines 78.

The PBX also provides signals to the automatic dialer 50, indicating whether the call status is busy, ringing, or a "live call." The automatic dialer 50 in turn provides the status information to the server computer 20.
20 If the server 20 is notified of a live call, the server 20 determines whether an agent is available, i.e., he is logged on, is not currently engaged in a call, and has set his status to available through manual input to the workstation 30. If two or more agents are available, the call is
25 assigned to the agent who has been available for the longest time.

Having selected the agent, the server provides control codes to the PBX 60 indicating the telephone set to which the call will be transferred. These control codes are
30 provided to a control input port of the PBX, such as the port which would be used to connect the PBX 60 to an

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1 automated attendant. PBX 60 responds to these control codes
by transferring the call to the appropriate telephone set
40. PBX 60 provides a unique triple beep signal to the
telephone set 40, indicating that the transfer of a live
5 call will follow immediately. This prepares the agent to
respond to the called party's greeting as though the agent
has heard it; actually, the greeting is generally completed
by the time the transfer of the call to the agent is
complete.

10 While the call is being transferred to the agent,
the server computer 20 is simultaneously transferring data
records to the agent's workstation 30. The workstation 30
displays basic called party information (e.g., name,
address, and phone number) which allows the agent to
15 establish the identity of the called party before proceeding
further with the call.

After providing the called party's identity, the
workstation 30 displays more detailed information for
processing the call, and provides input fields into which
20 the agent can enter responses to predetermined questions via
input device 32, for example, a computer keyboard or a mouse
pointer device.

The present invention provides the agent with full
telephone keypad functionality in the display terminal 30.
25 The agent is focused on the dual tasks of simultaneously
maintaining a conversation and entering data into the
terminal 30. The ability to perform these tasks without
error is improved if the agent does not have to divert his
hands from the input device 32 or his attention from the
display terminal 30 in order to operate the telephone set
30 40.

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1 During any ongoing call, the agent can use the
input device 32 to adjust the volume of the call up or down,
completely mute the agent's voice transmission, or restore
the agent's voice transmission (unmute) when it is muted.
5 Using only the input device 32, the agent can release the
call without disconnecting (flash), to simulate the
operation of the telephone hookswitch, and disconnect
(hangup) from the called party.

 In addition to the functions provided during
10 calls, the present invention allows the agents to originate
intercom calls, CO calls and pages from their terminal input
device 35 without pressing any of the keys of the base 42 of
the telephone set 40. When intercom calls (handled by the
PBX) and CO calls are made, the entire phone number is
15 entered at the keyboard 32 followed by a carriage return.
The number appears on the display 30 as it is entered. Then
it is translated into control codes and transferred to the
PBX 60.

 Unlike dialing the number using the telephone set
20 40, the agent can erase incorrect numbers with the backspace
key and re-enter them. After the entire dialed number or
other function is entered correctly, the server reformats
the message into a set of control codes for the PBX 60.
These control codes are applied to the control input port of
25 the PBX 60 which performs the function requested by the
operator.

 The present invention enables an agent to
broadcast a message to any one of 9 page zones serviced by
the PBX, or to all 9 zones simultaneously, under keyboard
30 control. Two different kinds of paging are available. With
the first type (internal paging), messages are transmitted

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1 to zones where telephones are installed. Messages are heard
through the speakers in the paged telephone headsets 44.

The second type of paging is external paging.
External paging messages are broadcast through external
5 loudspeakers independent of the telephone extensions. This
is useful in locations where telephone extensions are not
installed, or in zones beyond the audible range of
internally paged messages from telephone extensions.

An added feature of the paging function allows the
10 paged party to rapidly establish a connection with the
paging party. The agent requests in his paging announcement
that the paged party should dial a two digit code from any
phone. The agent remains on the line after completing his
announcement. When the two digit code is dialed, the paged
15 party is immediately connected to the agent.

The method for controlling the phone functions
from the input device 32 is as follows. Input device 32
commands cause the transfer of a message to the server 20
via the LAN 70. This message identifies what key has been
20 pressed. If the message entails pressing a number of keys,
these are collected in the server until a carriage return is
received. In response to this message, the server computer
20 puts the command in a format suitable for the control
port of the PBX 60 and sends the command over line 74 to PBX
25 60.

The control input port of the PBX 60 is the same
port that would be used if the PBX 60 were connected to an
external control device, such as an automated attendant.
The format of the control message is different for different
30 types of PBX and so, is not described in detail.

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1 Line 74 between server 20 and PBX 60 operates in
parallel with line 82 between the telephone set 40 and the
PBX 60, so that the capability to control phone operation
via the key pad on the telephone base 42 is not degraded.

5 A further advantageous feature of the system is
the automated calendar tool with which agents schedule
appointments for the called parties. This is particularly
useful for campaigns such as blood drives, in which
successful calls result in appointments. The predictive
10 dialing system maintains an appointment database. Once the
calendar tool is initiated, the locations at which the
called parties may be served are displayed on the
workstation 30 display via a pop-up menu such as that shown
in FIGURE 1a. The agent enters the party's choice of
15 location via input device 32 and a further pop-up menu,
shown in FIGURE 1b, displays a monthly calendar in which
days having available time slots at the chosen appointment
site are highlighted. The agent enters the party's choice
of date via input device 32 and a further pop-up menu, shown
20 in FIGURE 1c, displays a listing of the available time slots
for the chosen date. The system allows multiple
appointments to be scheduled for each time slot in
accordance with the number of parties actually served at
once. If this capability is used, the system automatically
25 updates the calendar function database to keep track of the
number of available appointments for each time slot at each
location. Finally, the calendar function allows the agent
to cancel a previously scheduled appointment using the same
pop-up menus described above.

30 In addition to the new agent functions described
in the above description, the predictive dialing system

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1 employs improved scheduling methods. These methods result
in a high percentage of each agent's time being spent in
productive conversation. Another measure of the value of
the scheduling method is the frequency with which a live
5 call is established with no agent available to attend the
call. The predictive dialing system allows the system
administrator to choose from two alternative methods for
handling these "unattended" calls. The system can be set up
to drop (i.e., disconnect from) a live call as soon as it is
10 determined that no operator is available. Alternatively,
unattended calls may be placed in a queue, so that agents
are assigned to the queued calls on a first-in, first-out
(FIFO) basis as the agents become available.

The selection of whether to allow queuing of
15 unattended calls is based on an assessment of the impact the
delays will have on the overall success of the campaign. In
a typical campaign, only about 50% of the calls dialed
result in live connections with a called party. The bulk of
the calls result in a busy signal or a ring without answer.
20 Given this situation, there may be reluctance to drop a call
once it is established. On the other hand, requiring the
called party to wait may result in reduced receptiveness for
the agent's message. In some cases the called party even
hangs up before the agent becomes available. Whichever
25 method is selected, the predictive dialing system minimizes
the number of unattended calls.

FIGURE 2 shows a flow chart of the scheduling
method for the predictive dialing system with a call wait
queue. At step 100, the system administrator selects
30 initial operating parameters for the system. The two
parameters which are used as to measure the quality of

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1 service are 1) the time a called party must wait for an
agent after answering the phone and 2) the percentage of
time that each agent spends engaged in conversation with
called parties. It is desirable to minimize the maximum
5 time that a party must wait while maximizing the number of
agents that are attending to called parties at any given
time. These goals are conflicting, however, since if the
queue of waiting calls is empty then agents are likely to be
idle while if agents are being fully utilized, it is likely
10 that clients are spending excessive amounts of time waiting
for an operator to become available. To be effective, the
system desirably achieves a balance between these two
competing goals.

At step 102, the administrator enters initial
15 estimates for the average dialing time per call and the
average time spent by the agent per conversation. The
average dialing time includes actual dialing time, plus the
time spent waiting for an answer. Failed calls (busy and
ring with no answer) are included in the average. The
20 average time spent by the agent per conversation includes a
brief period between calls known as "wrap up," during which
the agent is not available to answer additional calls.
During this period, the agent may take a short break or may
finish any data entry associated with the last call. These
25 estimates may initially be provided using modelling data or
estimates based on results from other campaigns or other
installations.

At step 104, the system counts the number of
agents currently available to receive calls and the number
30 calls that can be initiated by the automatic dialer 50. At
step 106, an initial average queue waiting time is computed

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1 based on the previously calculated parameter values. The specific algorithm used is described below with reference to FIGURE 2a.

5 At step 108, with all initial parameters set, the system is ready to begin automatic dialing of calls. At step 110, the system is in a wait state until a state change occurs. A state change may be the called party answering a call, an agent beginning a conversation, completion of a conversation, or a change in the number of active agents or
10 the number of calls that can be initiated by the dialer. At step 112, when any one of these state changes occurs, the number of active agents and the number of active calls for the dialer are counted. The average dial time and the average time a called party waits for an agent after
15 answering are updated with the new results.

At step 114, the system employs its scheduling method to update the desired maximum number of called parties waiting for an agent at any given time. Step 114
20 comprises detailed steps 116 through 132, shown in FIGURE 2a. The scheduling method is based upon modelling the predictive dialing system as a time homogeneous Markov process, also known as a birth and death process. This model defines the behavior of the system in terms of its current state without regard to the details of its history
25 at each previous point in time. The birth and death process is described in detail in a textbook by H.M. Wagner entitled Principles of Operations Research, Prentice Hall, 1969, pp 869-875, which is hereby incorporated by reference.

30 The general steady-state behavior of the homogeneous Markov process is described by equations (1) and (2):

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$$1 \quad L(n-1)*P(n-1) = [L(n)+M(n)]*P(n) - M(n+1)*P(n+1) \quad \text{for } n \geq 1 \quad (1)$$

and

$$L(n)*P(n) = M(n+1)*P(n+1) \quad \text{for } n = 0 \quad (2)$$

5 where:

n = the number of call in the queue

L(n) = the arrival rate with n calls in the queue

M(n) = the departure rate with n calls in the

queue

10 P(n) = the probability that n calls are in queue

For the predictive dialing system, live calls, i.e. those that are answered by called parties, enter the queue according to a Poisson process, with a constant input
 15 rate L for all values of n. Agents become available and respond to live calls according to an exponential distribution, M. There are a limited number of agents, S, and a limit N on the number of calls in queue. Thus, the maximum number of attended plus unattended calls at any time
 20 is given by (S+N). The equations (3), (4) and (5) define the probabilities of having a given number of calls in the system.

$$L*P(n) = M*P(n+1) \quad \text{for } n = 0 \quad (3)$$

$$25 \quad L*P(n-1) = (L+M)*P(n) - M*P(n+1) \quad \text{for } 0 < n < S+N \quad (4)$$

$$L*P(n-1) = M*P(n) \quad \text{for } n = S+N \quad (5)$$

From these equations, the equations (6), (7) and (8) can be derived which define the probability of having n
 30 calls in the system (i.e. in the queue and being handled by agents).

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$$1 \quad P(0) = 1 / \left[\sum_{n=0}^S (R^n / n!) + R^{S+1} / (S * S!) * (1 - R^N / S^N) / (1 - R/S) \right] \quad (6)$$

$$P(n) = R^n * P(0) / n!, \quad \text{for } n \leq S \quad (7)$$

$$5 \quad P(n) = R^n * P(0) / (S! * S^{(n-S)}) \quad \text{for } S < n \leq S+N \quad (8)$$

where:

$R = L / M$ and

! is the factorial function

10 Steps 116 through 132 comprise a half interval technique for selecting a value for N, which defines the maximum the number of calls in the queue, given the remaining system parameters. At step 116, initial ranges are determined for N, setting the minimum value at 1 and the
15 maximum value at twice the number of agents. The initial value of N is set equal to the midpoint of the range. This value and the process values set in steps 102, 104 and 112 are applied to the above equations to determine the probability density function, P, for the number of calls in
20 the system, the probability, P(0), that the system is empty and the probability, P(N+S), that the system is full. From these probability values, the expected queue wait time, the expected number of calls, the expected queue length, the expected number of busy agents, and the expected number of
25 calls served may be calculated, using the values collected in steps 102, 104 and 112.

At step 118, the range for N is reduced by half, to converge on the N value which satisfies the minimum agent busy-time constraint. If the expected number of busy agents
30 is greater than the target value, then the range for the number N (the maximum number of callers in the queue) may be

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1 decreased, so the new range maximum is set to the old
midpoint. If the target number of busy agents was not met,
however, then the range for N is increased so that there is
a larger pool of callers available for the idle agents. In
5 this instance, the new range minimum is set to the old
midpoint. If the required average number of busy agents is
met exactly, then the final minimum value for N is
established. This value represents the smallest maximum
queue size that meets the operator busy time requirement.

10 At step 120, a second range reduction process is
performed, to converge on the maximum queue size which
complies with the allowable queue waiting time constraint.
Given a constant number of agents, the expected queue
waiting time, or queue delay, over the interval is directly
15 proportional to the number of callers in the queue.
Consequently, the queue delay used in the flow-chart diagram
is the number of callers in the queue. This process is
essentially the same as the process outlined above except
that, during each iteration, if the expected maximum queue
20 delay exceeds the preset maximum queue delay, the new range
maximum is set to the old midpoint and if the expected
maximum queue delay is less than the preset maximum delay
value, the new range minimum is set to the old midpoint. If
the expected waiting time matches the maximum waiting time
25 then the final maximum value for N is established.

If the expected waiting time does not match the
maximum waiting time then, at step 122, the steps 116, 118
and 120 are repeated until the difference between the
maximum queue waiting time and the minimum queue waiting
30 time is unity. The maximum queue length is set to the
average of the minimum and maximum queue waiting times.

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1 This maximum queue length represents a queue
length at which the expected queue delay equals the desired
maximum queue delay. The remainder of the program
calculates a minimum queue length at which the desired
5 expected number of busy agents is achieved.

At step 126, a further test is made to determine
whether the first range for N has converged on a minimum
value, for which the required agent busy time is met. If
not, then the minimum range is reduced at step 128. Steps
10 126 and 128 repeats the same processes performed at steps
116 and 118. Steps 126 and 128 are repeated until the
difference between the minimum number of busy agents and the
maximum number of busy agents is unity. At step 130, the
final minimum value of the range for N is set to the N value
15 provided in step 128.

At step 132, the final value for N is set to the
average of the final minimum value provided in step 130 (or
step 118), and the final maximum value provided in step 124.
This value represents a desired queue length which makes a
20 compromise between the maximum wait in the queue and the
minimum number of busy agents.

At step 134, the current number of unattended
calls in the queue is counted. At step 136, the number of
unattended calls is compared to the newly updated desired
25 value of N provided in step 132. If the actual value is
less than the desired value, more calls are dialed. If the
actual value exceeds that desired number of calls, then the
predictive dialing system does not dial any further calls
until a new value for N has been calculated using the steps
30 110 through 132.

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1 FIGURE 3 shows a flow chart of the scheduling
method for the predictive dialing system without a call wait
queue. At step 200, the system administrator selects
initial operating parameters for the system. The two
5 parameters which measure the effectiveness of the system are
the percentage of calls which are disconnected because no
agent is available, and the number of agents that are
engaged in conversation with called parties at any given
time. It is desirable that as few callers as possible be
10 disconnected without being served, while the percentage of
agent busy time be kept as high as possible.

At step 202, the administrator enters initial
estimates for the average dialing time per call and the
average time spent by the agent per conversation. The
15 average dialing time includes actual dialing time, plus the
time spent waiting for an answer. These estimates may
initially be provided using modelling data or estimates
based on results from other installations. After the system
is in use at an installation long enough to establish smooth
20 operations, empirical data from the campaign may be used.

At step 204, the system counts the number of
agents currently available to receive calls. At step 206,
an initial estimate for the number of calls for the
automatic dialer is computed based on the previously input
25 parameters. The specific algorithm used is described below
at step 214.

At step 208, with all initial parameters set, the
system is ready to begin automatic dialing of calls. At
step 210, the system is in a wait state until a state change
30 occurs. At step 212, when any state change occurs, the
number of active agents and the number of calls for the

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1 dialer are counted. The average dial time and the average conversation length are updated with the new results.

At step 214, the system employs its scheduling method to update the percentage of lost calls. Step 214
5 comprises detailed steps 222 through 234. The scheduling method is based on the same model and probability density function as in the system with a waiting queue, with one exception. The probability of having n calls in the system is zero for all n greater than S , the number of agents.

10 Steps 222 through 234 comprise a half interval technique for selecting maximum values for D , the number of active calls for the automatic dialer, and L , the time between automatically generated calls, given the remaining system parameters. At step 222, initial ranges are
15 determined for D , setting minimum value at 0 and the maximum value at the number of agents. The initial value of D is set equal to the midpoint of the range. These values and the above equations are applied to determine the probability density function for the number of calls, P and the
20 probability that the system is full. From these probabilities and the other values entered or collected at steps 202, 204, 206 and 212, the program calculates the expected number of calls; the expected number of busy agents; and the expected number of calls served.

25 At step 224, the range for D is reduced by half, to converge on the D value which satisfies the constraint on the minimum number of busy agents. The new range maximum is set to the old midpoint, if the required average number of busy agents is exceeded. The new range minimum is set to
30 the old midpoint, if the required minimum number of busy agents is not met. At step 226, a convergence test for D is

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1 performed. Steps 222 through 226 are repeated until the
difference in the range for D is unity. A final value for D
is established if, in any iteration of the algorithm, the
expected number of busy agents matches the desired minimum
5 of busy agents.

At step 228, the minimum value of the range for L
is set to the average dialing time, and the maximum value is
set to M, the average length of a conversation. The
probability density function is again computed. At step
10 230, new range endpoints are selected to reduce the range
between minimum and maximum values of L.

At step 232, a test is made to determine whether
the range for L has converged on a minimum value, for which
the required agent busy time is met. If not, steps 228 and
15 230 are repeated until convergence is achieved. If the
expected number of busy agents is found to match the minimum
number of busy agents for any value of L, this value is
selected as the final value.

At step 234, the final delay between calls is
20 computed as the difference between the average dialing time
and the original average dialing time. The percentage of
lost calls is equal to the probability that the system is
full and all agents are unavailable. The values for the
desired minimum number of busy agents and the number of
25 calls for the automatic dialer are provided.

At step 216, the current number of calls for the
dialer 50 is counted and compared with the result of step
226. If the current value is different from the desired
value, the necessary number of additional simultaneous calls
30 for the dialer are activated or deactivated. At step 220,
the system continues to dial new calls at a fixed interval,

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1 defined by L, and to update system parameters with each state change, in step 210.

Referring back to FIG. 1, in an alternative embodiment, each terminal 30 preferably includes an INTEL
5 80386 microprocessor, RAM, PROM, hard drive memory, and stored programs and databases including an ORACLE® database. Each terminal 30 is coupled to the LAN interface 70. Each telephone 42 is coupled through a computer port interface (CPI) link to lines 82 for communicating with the PBX 60 at
10 19,200 baud. The LAN interface 70 acts as a node controller and is preferably a personal computer having an INTEL 80386 microprocessor, 8 megabit (MB) RAM, and a 100 MB hard or fixed drive to support a plurality of terminals, for example, 24 terminals operating via the CSMA/CD protocol.

15 In another preferred embodiment, the dialer 50 includes an INTEL 80386 microprocessor, 4 MB RAM, and a 80 MB hard or fixed drive for storing programs including an operating system and the predictive dialing programs. The data source 10 in FIG. 1 includes a dialer database for
20 storing names and target telephone numbers of parties to call, and an appointment database for storing names of parties and dates and times of appointments of parties, with the parties including persons or clients such as companies and organizations to be solicited or contacted for the
25 telemarketing campaign.

In an alternative embodiment, as shown in FIG. 5, the server 20 includes a server memory storing agent, dialer, and appointment information in respective databases, a call queue, and an agent queue. The server memory also
30 includes stored programs including the outbound and inbound call processing routines. In the alternative embodiment,

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1 the server 20 is preferably an INTEL 80486 based
microprocessor system running the UNIX operating system and
including a 1.2 gigabit (GB) memory to operate the
predictive dialing system of the present invention.

5 The daily download to the server 20 at the
beginning of each day from the data source 10 includes agent
information having initial individual agent names, numbers,
and designations as being inbound or outbound agents. Upon
the server 20 receiving the downloaded information,
10 telephone numbers are stored in the portion of the server
memory holding the dialer information; the agent names,
numbers, and initial inbound/outbound designations are
stored in the memory holding the agent information; and the
appointment data are stored in the appointment information
15 area of the memory; so that no further interaction between
the server 20 and the data source 10 is required for the
remainder of the business day.

For both inbound and outbound calls and for all
agents, both inbound and outbound, the apparatus according
20 to the present invention provides each agent with on screen
data on the displays of the agents' terminals for
facilitating data entry by input screens. As shown in FIG.
4, a display screen displays an activity selection screen
for data entry and for displaying additional windows, menus,
25 or screens. A title bar 275 indicates a title or other
screen information, and a command bar 280 displays available
commands which may be executed through the input device 32.
In response to a command from an agent, the display screen
displays a telephone control screen, as shown in FIG. 5,
30 having an on screen telephone keypad 255 and available
commands 260 for use by the agent as a regular telephone.

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1 For example, depressing the F2 key puts the phone off hook
and the F6 key controls the volume of the telephone speaker.
A telephone activity window 265 may also be displayed to
indicate telephone numbers input manually, agent log on and
5 log off status, and other information relating to the
telephone functions available to the agent. Outbound agents
are assigned to campaigns and so are logged on to the server
20, while inbound agents address inbound calls independent
of the outbound calls. Inbound agents, functioning apart
10 from the outbound aspect of the campaigns, are not logged on
to the server 20. Inbound callers, for example, may be
parties who independently call seeking appointments or
seeking to contribute or be involved with a campaign.

Referring back to FIGS. 1a-1c, the automated
15 calendar function is used in conjunction with the
appointment database in data source 10. As shown in FIGS.
1a-1c, each of the screens shown further includes a title
bar indicating a title or other information about the
displayed pop-up menu, and each of the screens may further
20 include a command bar displaying available commands which
may be executed through the input device 32.

In use, the predictive dialing system controls the
predictive dialing as well as agent telephone functions.
The outbound agents who have logged in for the day are each
25 assigned a campaign attribute in the agent information area
of the server memory, so that each outbound agent is only
assigned outbound calls from a single campaign. When an
outbound call is being transferred to an outbound agent, the
server 20 is simultaneously transferring data records to the
30 outbound agent's terminal 30. The terminal 30 displays
called party information or dialer information; for example,

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1 names, addresses, and phone numbers, allowing the outbound agent to establish the identity of the called party before proceeding further with the outbound call.

After providing the called party's identity, the
5 terminal 30 displays more detailed information on the display screen for processing the outbound call, and provides input fields into which the outbound agent may enter responses to predetermined questions via respective input device 32.

10 Inbound agents, however, may be employed for different duties than outbound agents in a campaign. In a telemarketing campaign, outbound agents, using dialer 50 to automatically dial outbound calls, are active; i.e. are pursuing new contacts for the campaign, while inbound
15 agents, in addressing inbound calls, are passive or reactive to establish successful contacts for the campaign by uninitiated and random inbound calls. All agents, whether outbound or inbound, are capable of generating, editing, and canceling appointments with contacted parties using the
20 calendar and appointment functions of the agents' respective terminals.

FIGS. 6A-6B illustrate a method of entering appointments. Each terminal 30 performs terminal routines in step 315, and displays an universal scheduler screen
25 having blank areas for inputs on the display screen of an agent's terminal in step 320. If the agent is an inbound agent, as determined in step 325, the inbound agent's terminal 30 receives inbound caller information from the input device 32 by entry from the inbound agent in step 330.
30 The information may be obtained from the inbound agent's conversation with the calling party. The terminal 30

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1 displays the inputted caller information of the calling party in the blank areas of the universal scheduler screen in step 335.

5 If the agent is determined in step 325 to be an outbound agent, the outbound agent's terminal 30 receives dialer information automatically from the dialer information area of the server memory upon connection of the outbound call to the called party in step 340. Upon the outbound agent eliciting the called party to agree to make an
10 appointment, the outbound agent enters a MAKE APPOINTMENT command at the input device 32 at step 350. In response to the MAKE APPOINTMENT command, the terminal 30 copies the dialer information received from the server 20 to a memory buffer in the memory of terminal 30 in step 355, and the
15 terminal 30 displays automatically the dialer information of the called party from the memory buffer in the blank areas of the universal scheduler screen in step 360.

With the party information or dialer information on display to the agent, whether inbound or outbound, the
20 agent's terminal 30 may receive a calendar command in step 365 from the agent's input device 32, and the agent's terminal 30 generates and displays a calendar with available dates for appointments, preferably, in reverse video in step 370. See, for example, the calendar shown in FIG. 1b. The
25 terminal 30 receives an appointment date selection command from the agent through input device 32 in step 375, and generates and displays a time slot screen in step 380, such as the time slot pop-up menu in FIG. 1b.

The terminal 30 then receives a time slot
30 selection command to schedule an appointment in step 385, and generates and displays a dialog box in step 390

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1 confirming a scheduled appointment by displaying a selected
date and time in a box or window on the display. The
terminal 30 returns in step 395 to display the universal
scheduler screen and party information, and may receive a
5 SAVE APPOINTMENT command from input device 32 in step 400.
In response to the SAVE APPOINTMENT command, the terminal 30
saves the scheduled appointment and party information in the
appointment information area of terminal memory. This
information may be uploaded to the data source 10 at the end
10 of the campaign day to update the appointment and party
information in the data source 10 for subsequent downloading
from the data source 10 to the server 20 on the next
campaign day. The terminal 30 may then receive a
termination command in step 410 to terminate the calendar
15 command, and the terminal 30 returns to a dialer screen in
step 415, such as an agent activity screen as shown in FIG.
4. Each agent may also delete or reschedule appointments in
the server memory.

As appointments are made, edited, or cancelled by
20 agents, the server 20 updates the appointment information in
the appointment database in the server memory. The server
20 may also perform at least one download of the updated
appointment information to the dialer 50 during the campaign
day. The predictive dialing system may also remind agents
25 of scheduled appointments for a campaign day. At the
beginning of each campaign day, the download of appointment
information from the appointment database of the data source
10 to the server 20 also includes a file for use by the
server 20 to generate a reminder of upcoming appointments of
30 parties with the appropriate agents.

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1 According to an alternative embodiment, the
predictive dialing system of the present invention employs a
method as shown in FIG. 7 for controlling and conducting a
campaign, day to day, for a scheduled or specified duration
5 of time, such as a few weeks or months, by daily beginning a
campaign day in step 420, downloading information such as
dialer information and appointment information from the data
source 10 to the server 20 in step 425, designating each
agent in step 430 as either an inbound agent or an outbound
10 agent in the agent database of the server memory, having the
outbound agents at the beginning of the campaign day log on
to the server 20 in step 435, performing call processing
routines in step 440, continuing in the step 445 to perform
step 440 if the campaign day has not ended, and uploading
15 the campaign day activities from the server 20 to the data
source in step 450, including changes in the appointment
database by the making, editing, or canceling of
appointments during the campaign day.

 The performing of call processing routines in step
20 440 includes, as illustrated in FIG. 7, the performance of a
predictive dialing routine in step 470 concurrent with the
performance of an outbound call processing routine in step
480 concurrent with the performance of an inbound call
processing routine in step 490 such as to convert outbound
25 agents to inbound agents to address inbound calls. Briefly,
the predictive dialing routine in step 470 controls the
automatic dialing of outbound calls by the dialer 50, the
outbound call processing routine in step 480 connects
available outbound agents to the outbound calls, and the
30 inbound call processing routine in step 490 converts
outbound agents to inbound agents when needed and connects

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1 available inbound agents to inbound calls. Steps 470-490
are performed concurrently by the predictive dialing system
of the present invention, as inbound and outbound calls
occur concurrently during each campaign day, and the
5 predictive dialing methods of the present invention update
the scheduling and dialing of outbound calls during the
campaign day as the inbound and outbound agents address
calls in the campaign.

FIGS. 2 to 3a as described above illustrate the
10 predictive dialing routine for outbound calls. Further
outbound call processing is shown in step 480 of FIG. 7 and
further in FIG. 8. As shown in FIG. 8, the outbound call
processing routine is initiated in step 900 by checking for
a connection to a dialed outbound party in step 905, hanging
15 up in step 910 if there is no connection, and continuing to
check and wait for a connection to a dialed party in step
905. If a connection to a dialed outbound party is
detected, the outbound call processing routine checks for an
available outbound agent in step 915. If no available
20 outbound agent is detected, the outbound call processing
routine hangs up in step 910 so that the connected dialed
outbound party is not held on the line waiting for an
outbound agent.

If an outbound agent is detected to be available
25 in step 915, the dialer 50 signals the server 20 of the
connection of the predictive dialing system to the dialed
outbound party in step 920, the server 20 retrieves in step
925 the dialer information about the dialed outbound party
from the dialer database in the server memory. The server
30 20, in step 930, assigns and connects the dialed outbound
party to the workstation of the available outbound agent,

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1 with the assigning and connecting substantially simultaneous
with the server 20 transferring the dialer information to
the terminal 30 for display. Since a number of outbound
agents may be working simultaneously during the campaign,
5 the outbound call processing routine in FIG. 8, after step
930, returns to step 905 to check if the predictive dialing
system of the present invention has concurrently established
additional connections to dialed outbound parties.

The performing of the inbound call processing
10 routine in step 490 in FIG. 7 may includes the steps, as
shown in FIG. 9, of initiating the inbound call processing
routine in step 950, receiving an inbound call in step 955,
putting the inbound call in an inbound call queue in step
960, checking if an inbound agent is available in step 965,
15 and putting the available inbound agent in the inbound agent
queue in step 970. If no inbound agents are available in
step 965, at least one conversion threshold is checked in
step 975 to see if the at least one conversion threshold is
exceeded. If no conversion threshold is exceeded in step
20 975, the inbound call remains in the inbound call queue and
the inbound call processing routine loops backs to continue
to receive inbound calls in step 955. However, if at least
one conversion threshold is exceeded in step 975, the
inbound call processing routine checks in step 980 if an
25 outbound agent is available. If an outbound agent is
available in step 980, the available outbound agent is
notified in step 990 of an inbound call in the inbound call
queue; otherwise, if no outbound agent is available in step
980, the inbound call processing routine waits in step 985
30 for an outbound agent to become available, and then notifies

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1 the available outbound agent in step 990 of the inbound call
in the inbound call queue.

The server 20, running the inbound call processing
routine, automatically logs off the notified available
5 outbound agent in step 995, redesignates the available
outbound agent to be a new available inbound agent in step
1000, and puts the new available inbound agent in the
inbound agent queue in step 970. The redesignating of an
outbound agent to an inbound agent in step 1000 is noted in
10 the agent database in the server memory. A redesignated
inbound agent is indistinguishable from any other inbound
agent, as all agents in the campaign use the same terminals
of the predictive dialing system.

Preferably, after an available inbound agent is
15 put in the inbound agent queue in step 970, the inbound call
processing routine assigns and connects, on step 1005, a
first available inbound agent in the inbound agent queue to
a first inbound call in the inbound call queue, removes the
first inbound agent from the inbound agent queue in step
20 1010, removes the first inbound call from the inbound call
queue in step 1015, and loops back to receive an inbound
call in step 955.

The inbound call processing routine in FIG. 9
connects inbound agents to inbound calls, and converts
25 outbound agents to inbound agents to address inbound calls
as needed, with the need determined by the exceeding of a
conversion threshold in step 975. The checking of an
exceeding of a conversion threshold in step 975 may include
any of the threshold routines in FIG. 10. The conversion
30 threshold detection routine as shown in FIG. 10 includes the
steps of initialization in step 1020 and detection for a

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1 count of the inbound calls in the inbound call queue
exceeding a maximum count in step 1025.

If the inbound call count does not exceed a maximum, and if the duration of any of the inbound calls in
5 the inbound call queue exceeds a preset maximum time, a threshold condition exists (step 1040). If the longest time of inbound calls does not exceed the maximum time, but the duration of an inbound agent in the inbound agent queue exceeds a maximum time, another threshold condition exists
10 (step 1045). If no threshold condition is detected, the inbound call processing routine outputs NO in step 1035; however, if any of steps 1025, 1040, 1045 has any of the thresholds detected to exceed the corresponding maximum, a YES is output in step 1030. It is apparent to one skilled
15 in the art that steps 1025, 1040, 1045 may be performed in any order for detecting a conversion condition.

To set up the predictive dialing system for a campaign or to modify the operation of the campaign anytime during the campaign, a system administrator accesses a
20 system administration program in the server memory by entering an administrator password. Upon a grant of access by the server 20, the system administrator may input and change predictive dialing system parameters and agent information in a campaign profile, i.e. a set of parameters
25 of the campaign, using a Campaign Parameter Profile screen, as shown in FIG. 11. The Campaign Parameter Profile screen allows the system administrator to control the predictive aspect, or aggressiveness, of each campaign. Other aspects controllable by the system administrator include whether the
30 campaign is to use preview dialing, and how the dialer is to handle no-agent available calls, ring-no-answer calls, busy

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1 line calls, answering machine calls, etc. The information
on the Campaign Parameter Profile screen is displayed and
controllable by the system administrator as follows:

5 CAMPAIGN NUMBER - This is a number assigned to a
campaign to which the data entered by the
system administrator in the campaign
parameter profile screen applies. The
campaign number uses two digits; for example,
10 numbers in the range 01 - 14. To update an
existing campaign parameter profile for a
campaign, the system administrator enters the
two-digit number of the campaign. For a new
campaign profile, a default Campaign
15 Parameter Profile screen appears with blank
spaces for data entry or with default
settings to be reviewed and changed by the
system administrator. For an existing
campaign profile, the last saved information
appears. Upon entering a campaign number,
20 the campaign number appears on the campaign
parameter profile screen.

PREVIEW DIALING ENABLED - Preview Dialing
allows an outbound agent to see the call
record or dialer information for the person
25 to be called before the outbound call is
placed. Entering a Y for YES sends the call
record to an available outbound agent's
screen before the outbound call is dialed.
Entering an N for NO allows the outbound call
30 to be dialed, and then when the predictive
dialing system detects a live answer, both

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1 the outbound call and the call record are
sent to an available outbound agent.

5 MAXIMUM PERCENT ABANDONED CALLS - This entry
specifies a percentage of abandoned outbound
calls or system disconnects that is allowed.
When the predictive dialing system dials
ahead, sometimes a situation arises when two
or more connects are made when only one
outbound agent is available. Any extra
10 outbound calls are disconnected and the call
records of the disconnected extra outbound
calls are placed in a no agent re-dial queue
stored and maintained in the call queue in
the server memory. Note that the called
15 party hears nothing. A higher percentage
results in a greater possibility that
outbound calls are disconnected by the
predictive dialing system. If the percentage
is too low, however, the predictive dialing
20 system does not dial as aggressively.
Typically, between 5 and 10 percent is
entered.

25 MINIMUM AGENTS FOR DIAL-AHEAD - This entry
specifies the minimum number of logged-in and
available outbound agents assigned to the
campaign having the entered campaign number
described above before the dialer 50 dials
ahead, on the expectation that, when an
outbound call is answered, an outbound agent
30 is available to take the outbound call. If
fewer outbound agents than this number are

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1 logged in and available to this campaign, the
predictive dialing system waits to dial out
until more outbound agents become available.
A higher number means better performance of
5 the predictive dialing system. A whole
number is to be entered. Typically, 5 or 6
is entered, depending upon the number of
outbound agents that are typically expected
to be logged in.

10 AVERAGE AGENT WAIT TIME - This entry specifies a
target breathing time or quiet time between
outbound calls in seconds. The predictive
dialing system attempts to maintain this
average length of time between outbound
15 calls. A typical entry may range from 14 to
20 seconds. A minimum of 5 seconds and a
maximum of 99 seconds may be entered.

20 MAXIMUM RE-DIALS - This entry specifies the number
of dialing attempts that are to be allowed
for contacting an individual or a party such
as a corporation or organization. This entry
only applies to a particular dialing session
for the campaign; i.e. until the campaign is
suspended or stopped. When resuming the
25 dialing session on the following day, the
predictive dialing system assumes that an
individual has not been called previously and
starts counting from zero. A whole number is
to be entered. Typically, a number between 3
30 and 5 is entered. There is also a maximum
limit on the number of re-dials that applies

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1 to the call records' lifespan on the
predictive dialing system. This limit is
defined during campaign definition.

5 BUSY RESCHEDULE TIME - This entry specifies the
time, in hours and minutes, that the
predictive dialing system waits before re-
dialing a call record that returned a busy
signal. Typically, 15 minutes is entered
since a busy signal usually indicates that
10 the called party is home.

NO-CONNECT RESCHEDULE TIME - This entry specifies
the time, in hours and minutes, that the
predictive dialing system waits before
re-dialing a call record that was not
15 connected because of a no-dial tone condition
errors. Typically, this entry is between 30
and 40 minutes.

NO-AGENT RESCHEDULE TIME - This entry specifies
the time, in hours and minutes, that the
20 predictive dialing system waits before
re-dialing an outbound call that has been
disconnected because of a no-agent condition.
Typically, a minimum of 45 minutes is entered
here. This provides sufficient time to
25 elapse between the hang-up and the new
outbound call.

RING-NO-ANSWER RESCHEDULE TIME - This entry
specifies the time, in hours and minutes,
that the predictive dialing system waits
30 before re-dialing a call record that did not

35

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1 answer. Typically, this entry is between 1
 and 4 hours.

5 PASS OPERATOR INTERCEPT - This entry specifies
 what action is to be taken when the dialer
 detects a network intercept message; e.g.
 special information tone. Entering N for NO
 sends the call record to a no connect re-dial
 queue. Enter Y for YES sends the outbound
10 call to an outbound agent so that the
 outbound agent may listen to the message and
 update the call record accordingly.

15 PASS ANSWERING MACHINE - This entry specifies what
 action is to be taken by the predictive
 dialing system when the dialer detects an
 answering machine. Entering a Y for YES
 sends the outbound call to an outbound agent.
 Entering an N for NO sends the outbound call
 record to a no answer re-dial queue.

20 CAMPAIGN DIAL SELECTION - These entries specify
 when and to where outbound calls are placed.
 As shown in FIG. 11, the chart in the lower
 half of the Campaign Parameter Profile screen
 lists 24 hours in half-hour increments for
 the seven days in a week. The times are
25 given in military time; i.e. 2:00 p.m. is
 shown as 14, 8:00 p.m. as 20, etc. For each
 day of the week entries indicate where and
 when outbound calls should be dialed. There
 are four possible entries for each half-hour
30 time period, specifically:

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- 1 B for business number of parties to
 call;
 H for home number of parties to call;
 Y for either home or business number;
5 and
 N for no dialing.

Typically, outbound calls are placed Monday
through Saturday from 8:00 a.m. to 9:00 p.m.

In addition, corrections for different time zones
10 and for daylight savings time are provided for the
predictive dialing system. For example, if the Campaign
Parameter Profile specifies no calls until 10:00 AM, the
predictive dialing system of the present invention installed
in New York waits until it is 10:00 AM in California before
15 dialing outbound calls to areas codes in California.

For agent scheduling, the Agent Profile screen as
shown in FIG. 12 allows the system administrator to setup
agents in the predictive dialing system. Using the Agent
Profile screen, the system administrator may identify each
20 agent to the system by name and agent number, as well as
provide information about each agent to authorized
administrators. Every user of the predictive dialing system
is setup in the system via the Agent Profile screen before
they are able to log on.

25 Upon being accessed by an Agent Profile Screen
command, a blank Agent Profile screen appears with four
choices available:

30

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1 ADD for creating an agent profile;
 DELETE for deleting an agent profile;
 EDIT for updating an existing agent
 profile; and
5 LIST for listing all agent profiles in
 an abbreviated format.

 For each user the following six items may be
 entered: Agent Name; Agent Number from 1 to 129; Agent
 Status, which specifies each agent as either inbound (I) or
10 outbound (O) at the beginning of the campaign day; Campaign
 Identification (ID) number, which is a campaign number that
 the agent is assigned to work on, and the agent may be
 reassigned by the system administrator to a different
 campaign using a Reassign Agent command; ACD Group, with
15 agents grouped in automatic call distribution (ACD) groups
 with each ACD group assigned an ACD group number to be
 entered in this field; and Telerecruiter Code, a 10 digit
 number assigned to each agent that is unique. The
 Telerecruiter code is used for personnel identification
20 functions.

 For reviewing and modifying campaigns during the
 campaign day, a Dynamic Screen Profile Edit command menu
 allows the system administrator to choose which campaigns
 are displayed on the Dynamic Screen, and which agent groups
25 are displayed when agent groups are chosen on the Dynamic
 Screen. FIG. 13 shows the Dynamic Screen Profile Edit
 screen. The Dynamic Screen Profile Edit screen is divided
 into three sections: a Campaign Group section shown as
 GROUP, Agent Group sections shown as AGENT LISTS 1-4; and an
30 Alarm Threshold section.

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1 The Campaign Group section allows the system
administrator to list all the campaigns that need to be
displayed on the right side of the Dynamic Screen. Campaign
numbers may be added or deleted as necessary, and the
5 numbers may be in any order. The campaigns may be displayed
in numerical order on the Dynamic Screen.

Each of the Agent Group sections allows the system
administrator to assign agents to any of the agent groups.
A predetermined maximum number of agent, for example, 24
10 agents may be placed in an agent group. The agents may be
entered in any order and may be displayed in numerical order
on the Dynamic Screen. Using the Agent Working Screen as
shown in FIG. 4, a system administrator may also process
calls at their terminal in the same manner as an agent
15 processes calls at the agents' terminals.

The present invention may also include a Silent
Monitor feature. As a system administration feature only,
Silent Monitor allows the system administrator to listen to
a conversation in progress between an agent and another
20 party without being part of the conversation with a
telephone microphone of the system administrator off, so
that loud noises in the vicinity of the system administrator
are not heard. To use Silent Monitor, the user presses a
silent monitor command on the telephone or at input device
25 32 and dials the extension number of the agent to be
monitored.

The predictive dialing system according to the
present invention further includes stored programs for
compiling and reporting statistics gathered from the
30 predictive dialing activities. For example, percentages of
successful outbound calls; the number of redesignations of

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1 outbound agents to inbound agents; the performance of each
agent relating to the number of appointments made; the costs
involved for outbound calls for each campaign; and the
success percentage per geographic region may be provided.

5 While the invention has been particularly shown
and described with reference to the preferred embodiments,
it will be understood by those skilled in the art that
various modifications in form and detail may be made therein
without departing from the scope and spirit of the
10 invention. Accordingly, modifications such as those
suggested above, but not limited thereto, are to be
considered within the scope of the invention.

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-45-

1 WE CLAIM:

1. A telephone system for dynamic inbound and outbound call management having a private branch exchange (PBX) for connecting a plurality of telephone stations to a
5 telephone line, each of said telephone stations being assigned to one of a plurality of agents, and a dialer for automatically routing an outbound call, the telephone system comprising:

a processing unit including:

10 associated memory and stored programs for monitoring outbound and inbound calls;

designating means for designating each of the plurality of agents as either an inbound agent or an outbound agent;

15 detecting means for detecting an inbound threshold condition signifying the need for answering an inbound call; and

assigning means for assigning and connecting an available outbound agent for answering the
20 inbound call.

2. A telephone system providing appointment scheduling having a private branch exchange (PBX) for connecting a plurality of telephone stations to a telephone
25 line, each of said telephone stations being assigned to one of a plurality of agents, the telephone system comprising:

a processing unit including associated memory and stored programs for storing appointment information, the appointment information including dates and times; and

30 each of the plurality of telephone stations including:

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1 a display;
 an input device; and
 a processor responsive to input signals,
including a calendar command and an appointment command,
5 from the respective input device for generating a calendar
on the respective display of the respective telephone
station and for generating and editing the appointment
information in the associated memory.

10 3. A method for controlling a telephone system
having a plurality of agents, the method comprising the
steps of:

 logging on an outbound agent to the telephone
system;
15 dialing an outbound call using an automatic
dialer;
 connecting the outbound call to the outbound
agent;
 receiving an inbound call;
20 detecting for an inbound threshold condition;
 notifying an available outbound agent of the
inbound call if the inbound threshold condition is detected;
 logging off the notified available outbound
agent;
25 connecting the logged off outbound agent to
the inbound call;
 receiving a calendar command from one of the
plurality of agents; and
 generating a calendar on a display to
30 facilitate generating an appointment.

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1 4. The telephone system as set forth in claim 1
further comprising:
 queue means for generating a queue; and
 threshold means, responsive to an inbound
5 threshold condition of the queue, for generating a threshold
signal.

 5. The telephone system as set forth in claim 4
further comprising:
10 access means for logging on at least one of
the plurality of agents to the telephone system and for
logging off at least one of the plurality of agents from the
telephone system, the access means, responsive to the
threshold signal, for logging off a first outbound agent.

15 6. The telephone system as set forth in claim 5
further including:
 the detecting means, responsive to the access
means logging off the first outbound agent in response to
20 the threshold signal, for detecting that the logged off
first outbound agent is available to answer the inbound call
as the available outbound agent; and
 the designating means for designating the
logged off first outbound agent as an inbound agent.

25 7. The telephone system as set forth in claim 1
further comprising:
 the associated memory for storing appointment
information, the appointment information including dates and
30 times of appointments; and

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1 each of the plurality of telephone stations
including:

 a display;

 an input device; and

5 a processor responsive to input signals,
including a calendar command, from the respective input
device for generating a calendar on the respective display
of the respective telephone station.

10 8. The telephone system as set forth in claim 7,
wherein the appointment information further includes names,
addresses, telephone numbers, appointment locations, and
comments of appointments.

15 9. The telephone system as set forth in claim 7,
wherein each respective processor of each respective
telephone station, responsive to the input signals, edits
the appointment information in the associated memory.

20 10. The telephone system as set forth in claim 9,
wherein each respective processor of each respective
telephone station, responsive to the input signals,
generates on the respective display the calendar and
available dates and time slots for appointments.

25 11. The telephone system as set forth in claim
10, wherein each respective processor of each respective
telephone station displays on the respective display the
available dates and time slots with a visual appearance
30 different from the visual appearance of the calendar.

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1 12. The telephone system as set forth in claim
11, wherein the visual appearance of the available dates and
time slots includes color reversing the available dates and
time slots in reference to a ground of the calendar to
5 highlight the available dates and time slots on the
respective display.

13. The telephone system as set forth in claim 10
further including:
10 each respective processor of each respective
telephone station, responsive to a first input signal from
the input device corresponding to the respective agent
inputting a command, for generating an input screen on the
respective display, the respective processor, responsive to
15 a second input signal from the input device corresponding to
the respective agent inputting data, for displaying the
inputted data on the input screen on the respective display.

14. The telephone system as set forth in claim 13
20 further including:
 the associated memory, coupled to the dialer,
for storing dialer information including names and telephone
numbers of parties to be automatically dialed by the dialer;
 each respective telephone station being
25 operatively coupled to the associated memory, with each
respective telephone station further including a buffer for
storing dialer information from the associated memory;
 the dialer for dialing an outbound call to an
intended party, and for responding to a connection of the
30 dialed outbound call as a connected call for generating a
connection signal;

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1 the assigning means, responsive to the
connection signal, for assigning and connecting the
connected call to the available outbound agent;

5 transfer means, responsive to the connection
signal, for transferring the dialer information of the
intended party to the respective telephone station assigned
to the available outbound agent; and

10 the respective telephone station of the
available outbound agent for displaying the transferred
dialer information on the respective display substantially
simultaneous with the connecting of the connected call to
the available outbound agent.

15 15. The telephone system as set forth in claim 14
wherein each of the plurality of telephone stations further
includes:

 the input device for inputting data as dialer
information;

20 a buffer for storing the inputted dialer
information; and

 the processor for displaying the inputted
dialer information on the display.

25

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35

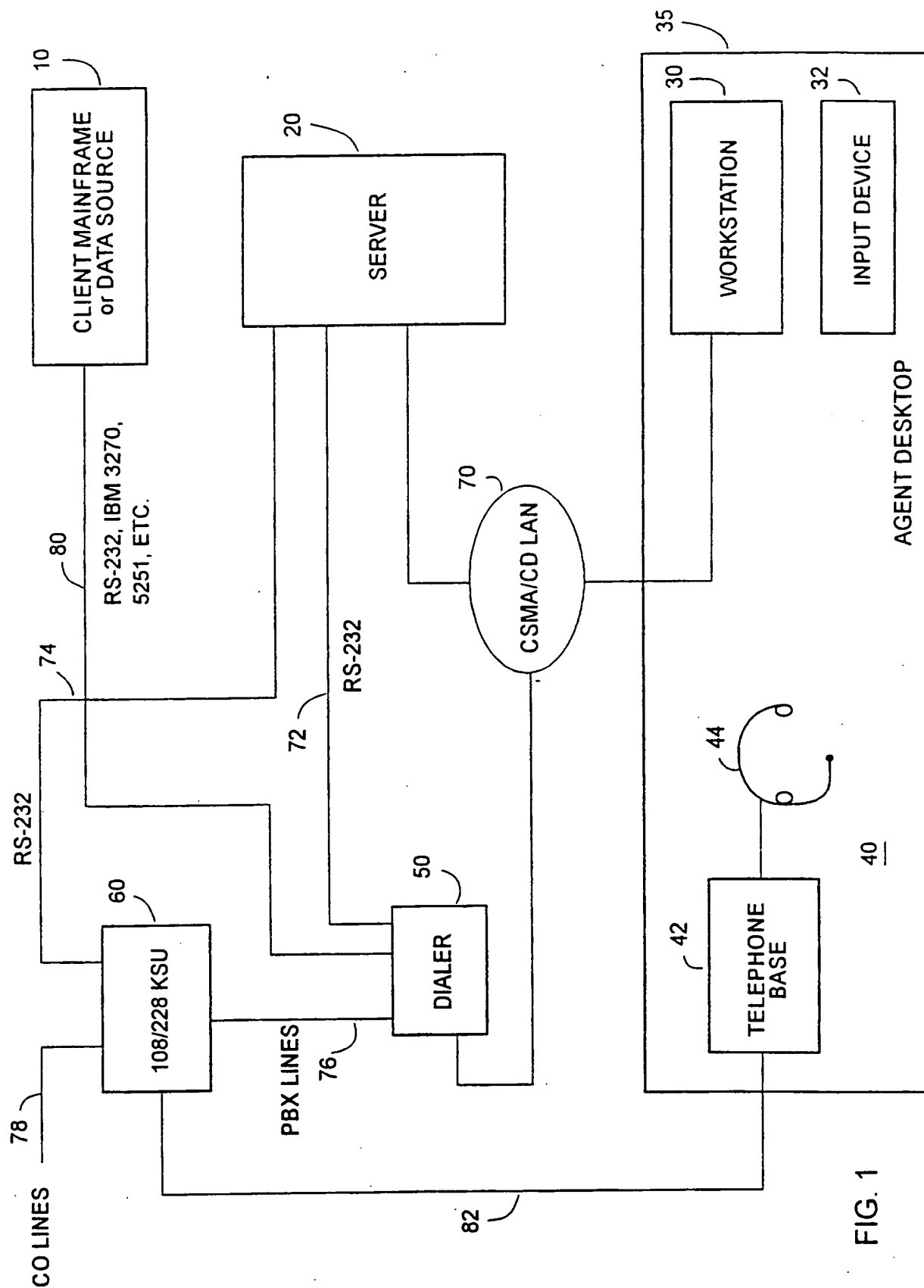


FIG. 1

DONOR APPOINTMENT MENU

SITE NAMES

0001 DOWNTOWN
 0003 WASH. COUNTY
 0004 ALLEGHENY
 0005 SUBURBAN EAST
 0006 SOUTH HILLS COM.
 0007 CITIZENS G. H.
 0008 FOX CHAPEL
 0009 NORTH HILLS COM.
 0010 ST. CLAIR M. H.
 0011 PETERS TOWNSHIP
 0012 Mc KEESPORT
 0013 WEIRTON COM.
 0014 SUBURBAN WEST.

F1 EXIT ? HELP

FIG. 1a

APPOINTMENT DONOR APPOINTMENT MENU DOWNTOWN

1990		AUGUST					1990
S	M	T	W	T	F	S	
			1	2	3	4	
5	6	7	8	9	10	11	
12	13	14	15	16	17	18	
19	20	21	22	23	24	25	
26	27	28	29	30	31		

F1 EXIT ? HELP

FIG. 1b

APPOINTMENT DONOR APPOINTMENT MENU DOWNTOWN

THURS. AUGUST 2, 1990

8:30	11:00	1:30	4:00	6:30
8:45	11:15	1:45	4:15	6:45
9:00	11:30	2:00	4:30	7:00
9:15	11:45	2:15	4:45	7:15
9:30	12:00	2:30	5:00	7:30
9:45	12:15	2:45	5:15	7:45
10:00	12:30	3:00	5:30	8:00
10:15	12:45	3:15	5:45	8:15
10:30	1:00	3:30	6:00	8:30
10:45	1:15	3:45	6:15	

MAKE CANCEL

F1 EXIT ? HELP

FIG. 1c

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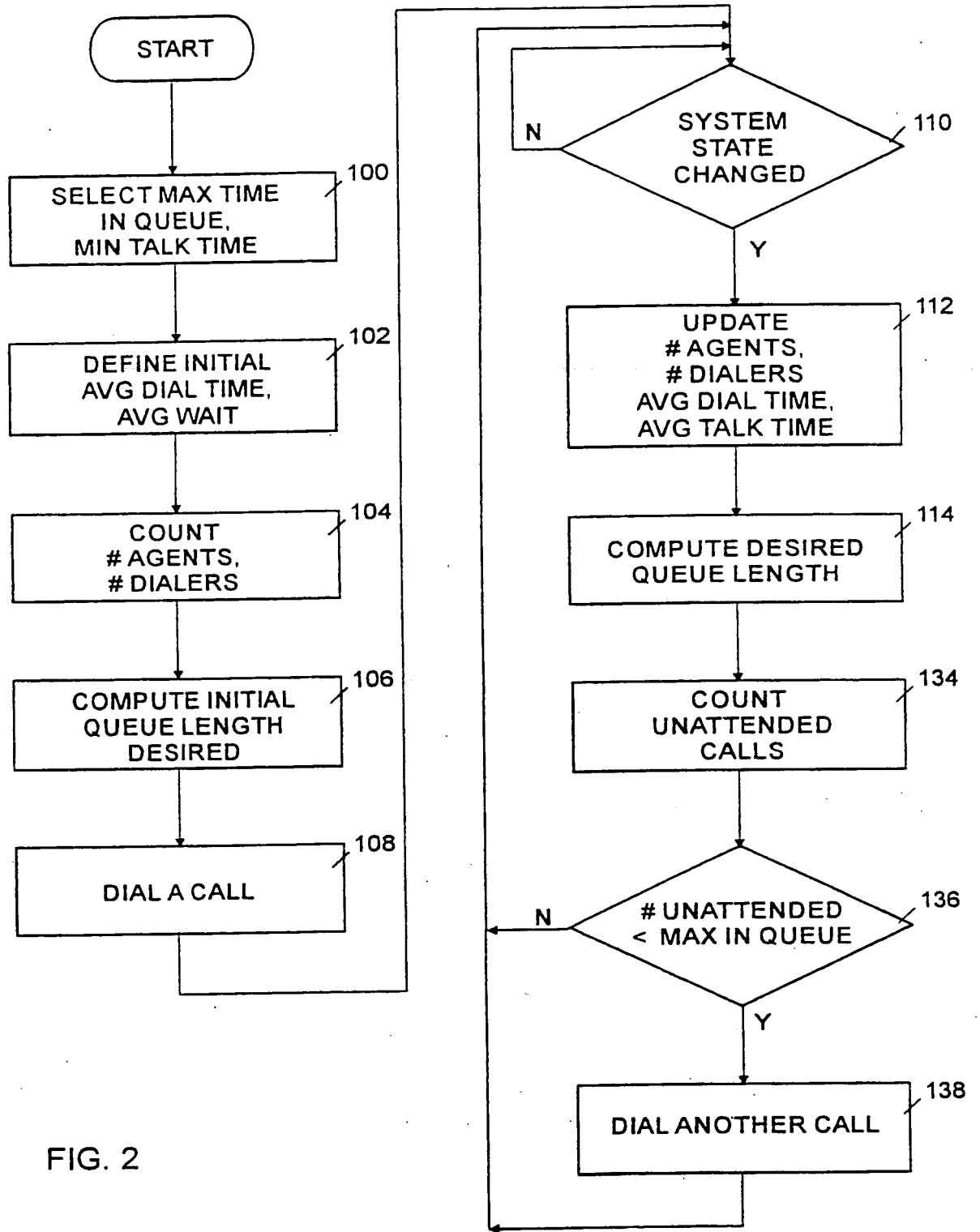


FIG. 2

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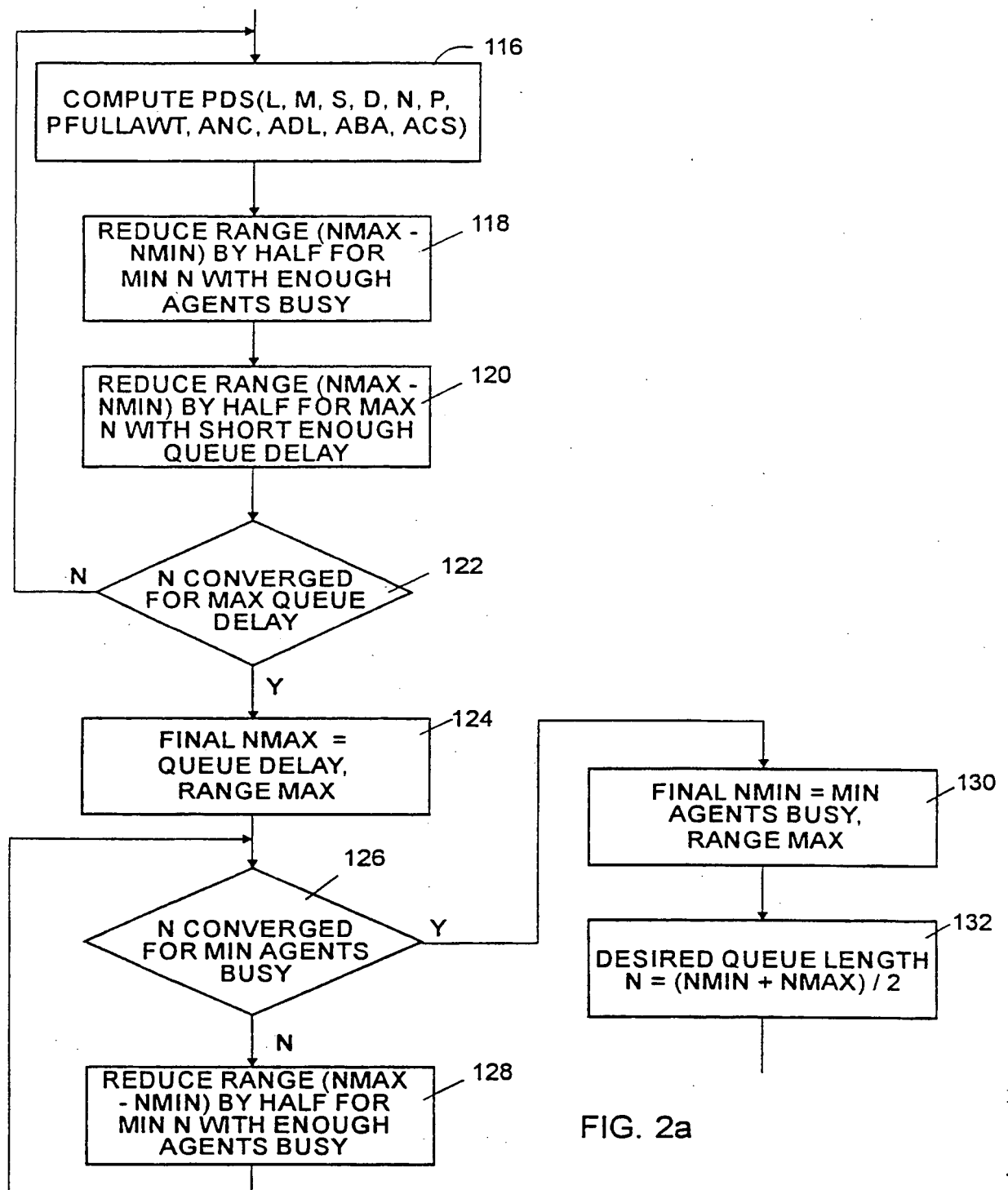


FIG. 2a

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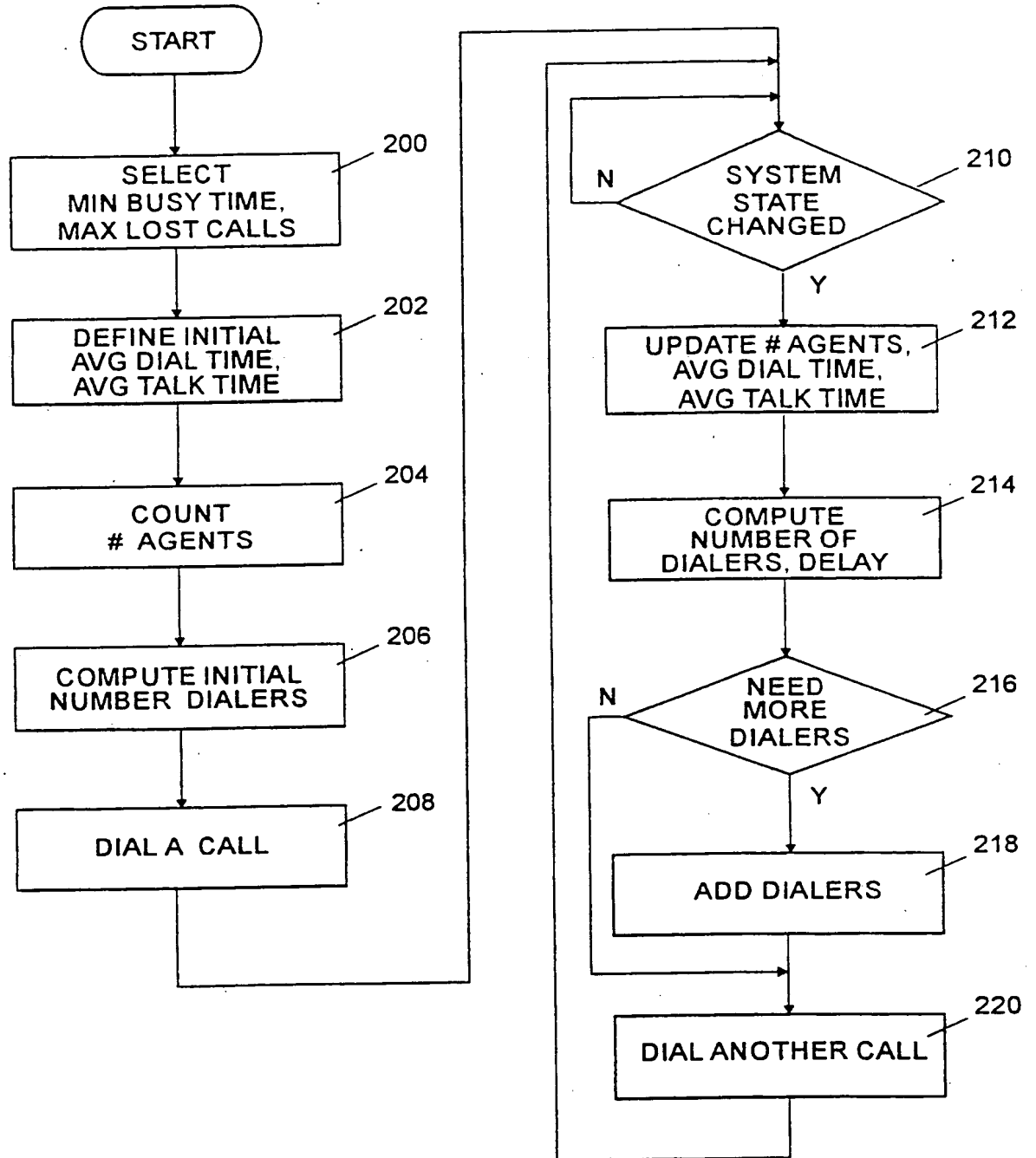


FIG. 3

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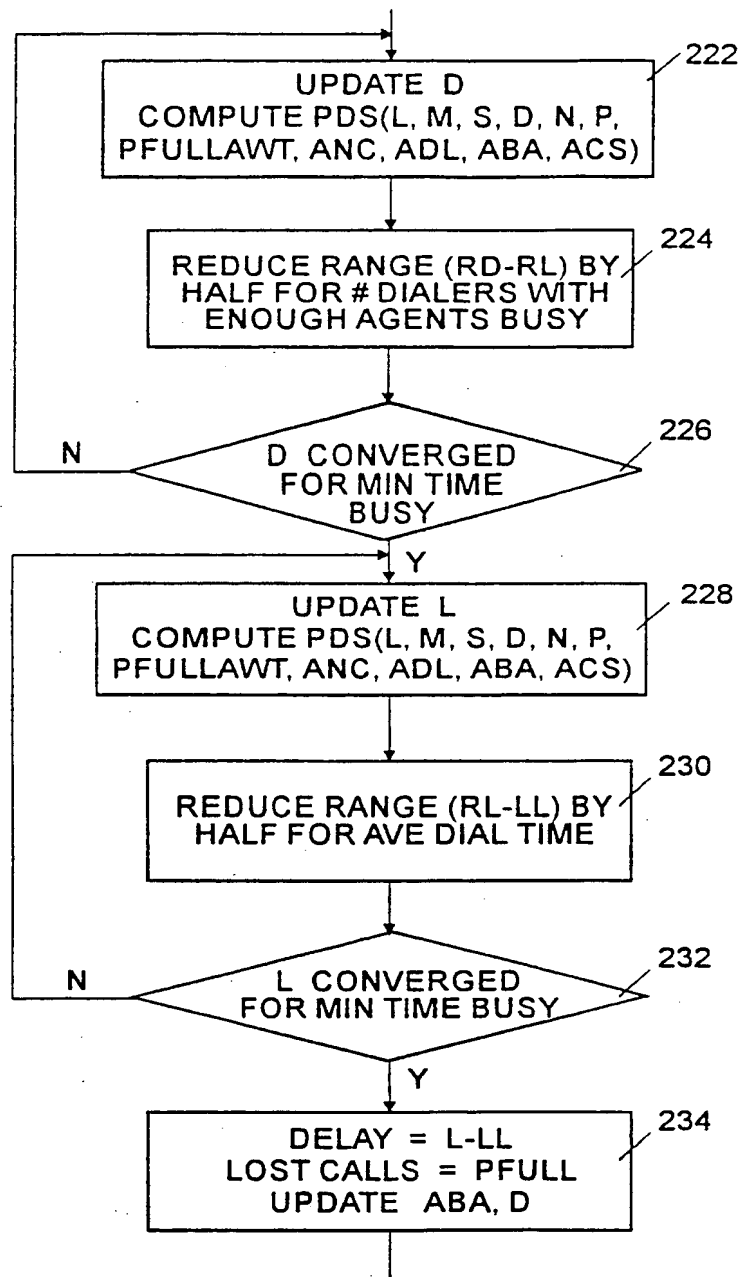


FIG. 3a

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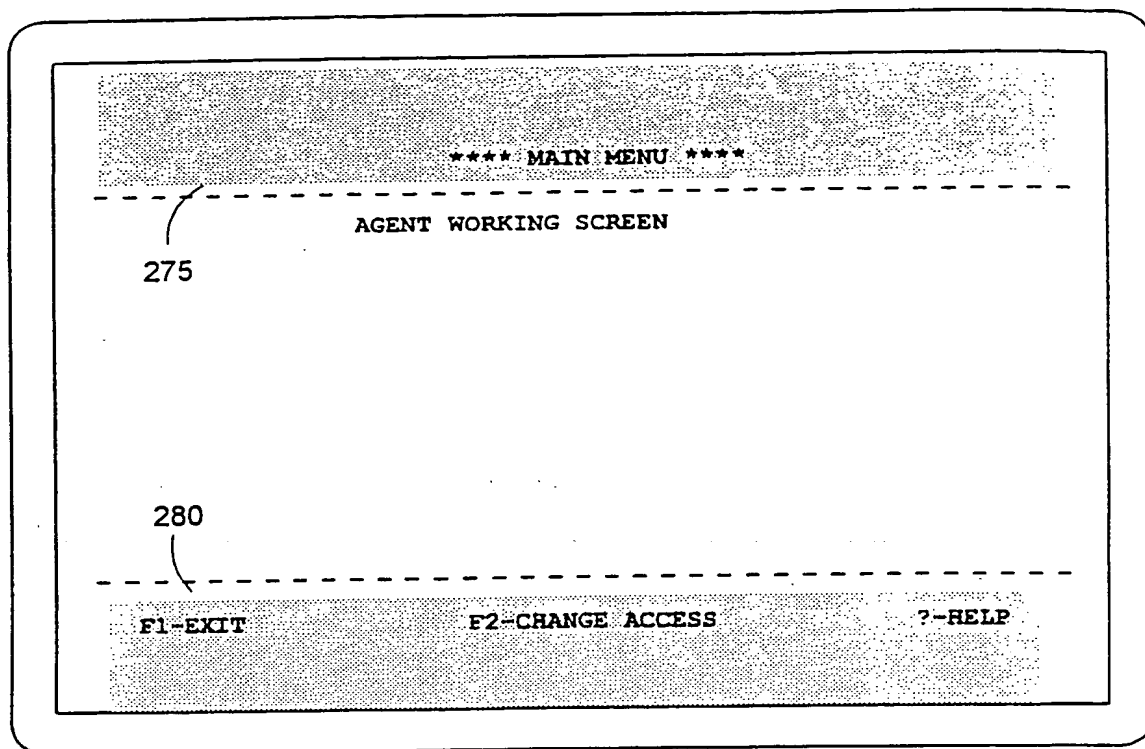


FIG. 4

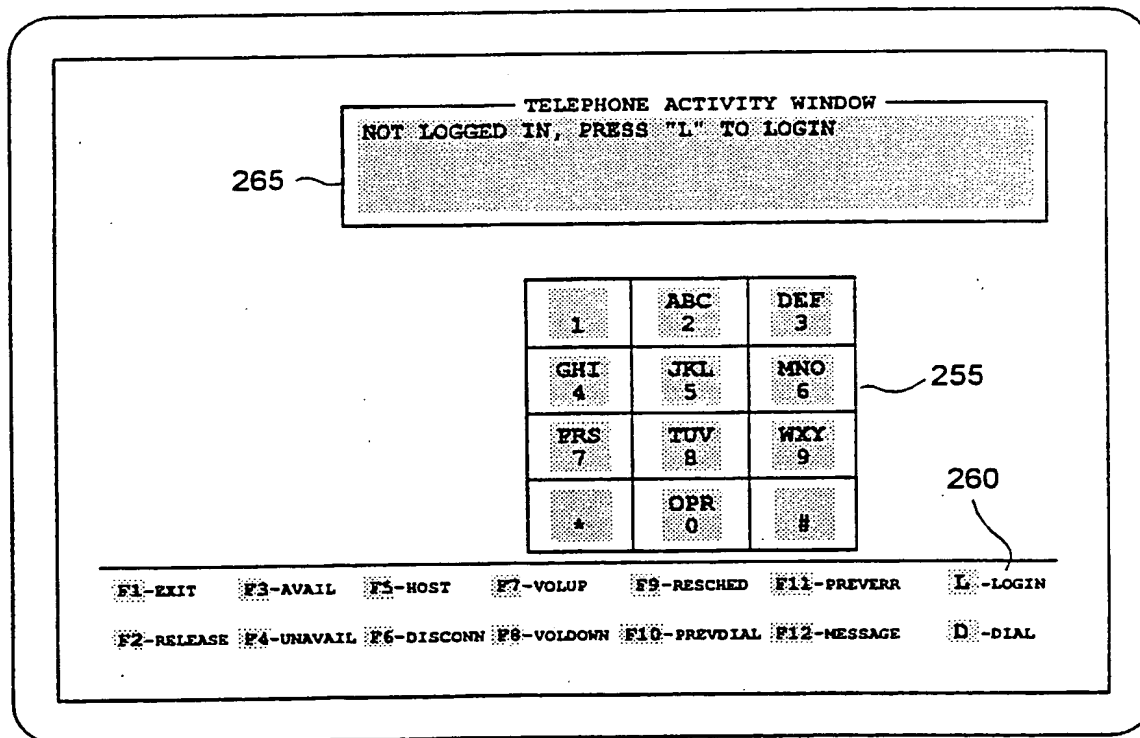


FIG. 5

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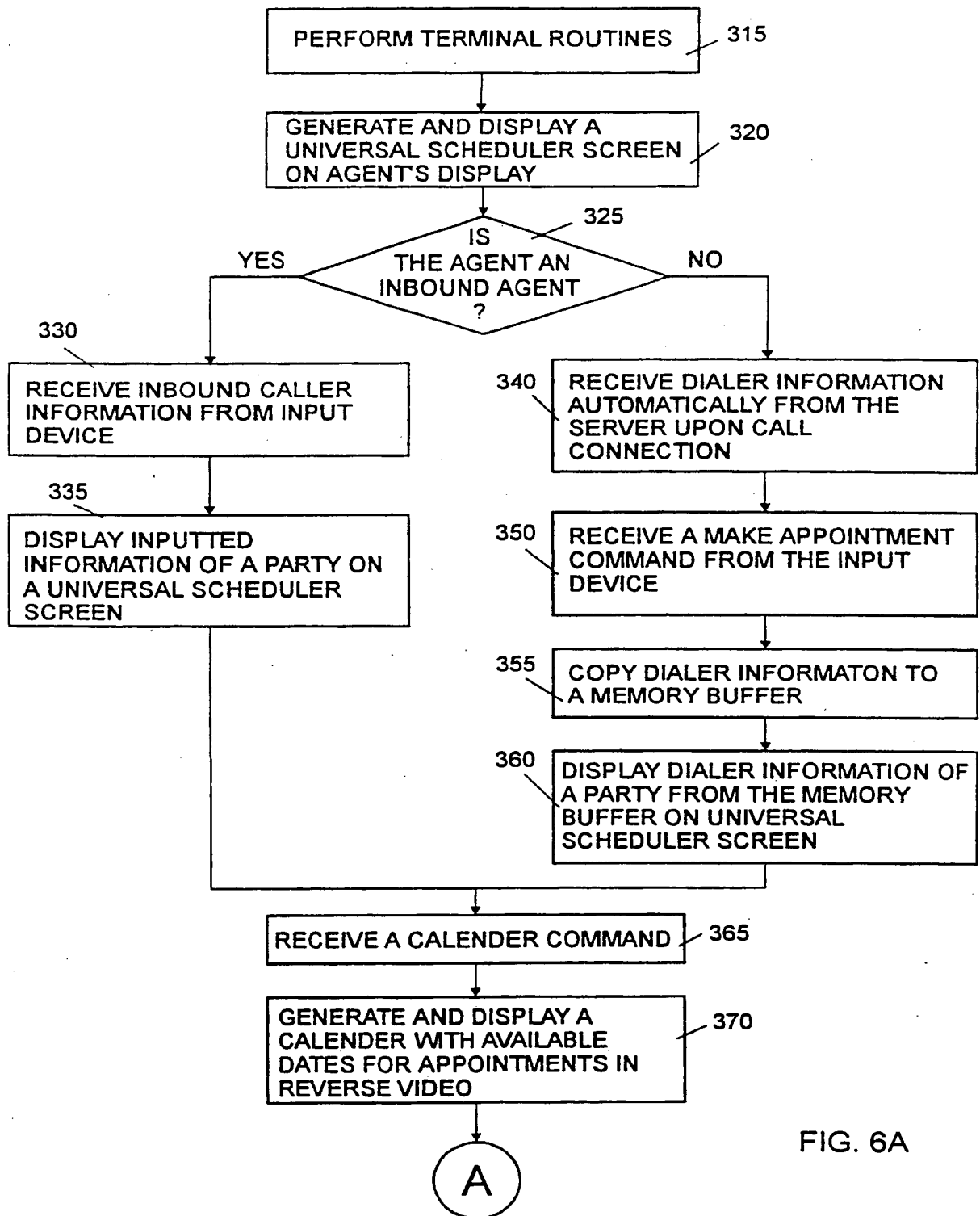


FIG. 6A

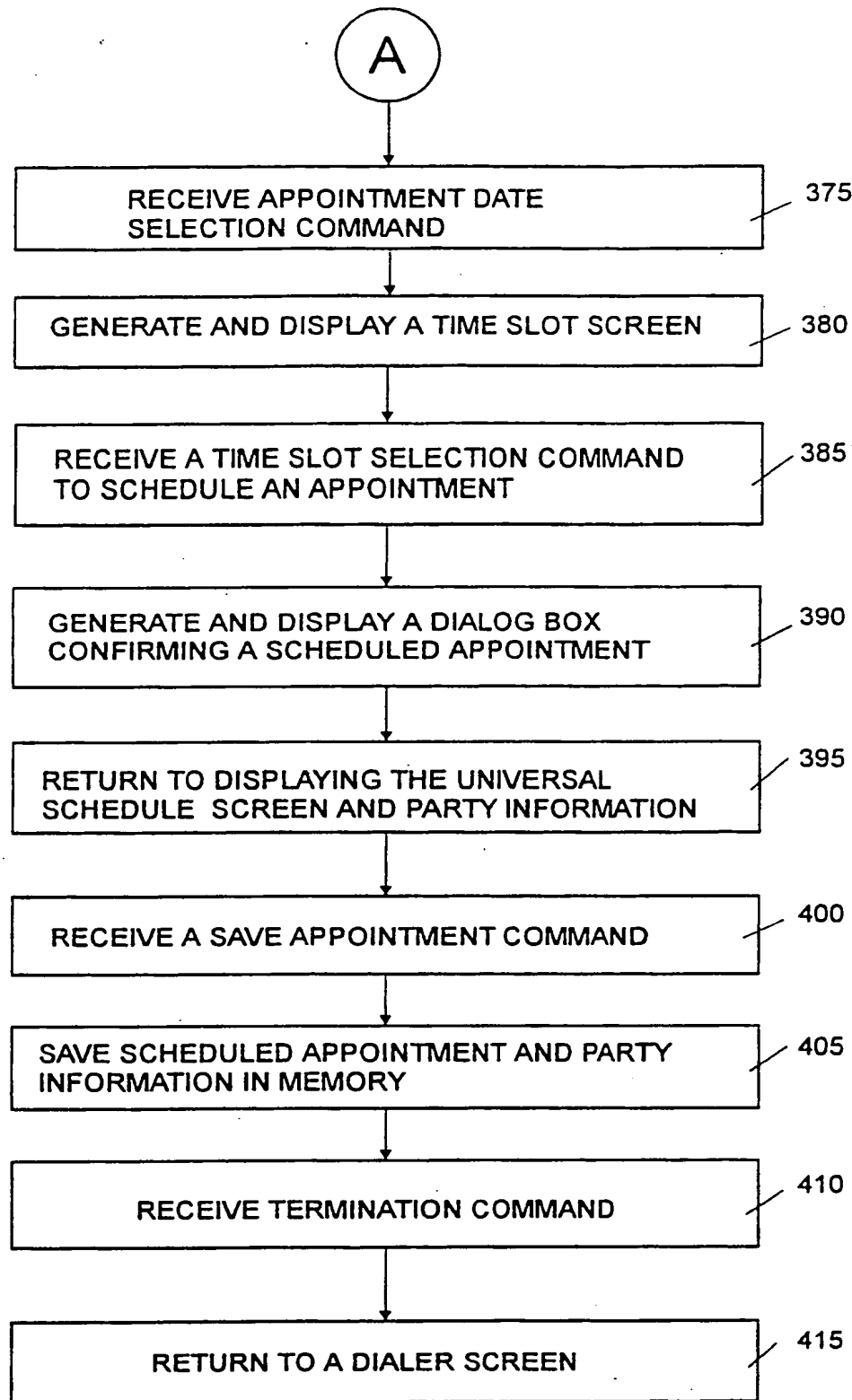


FIG. 6B

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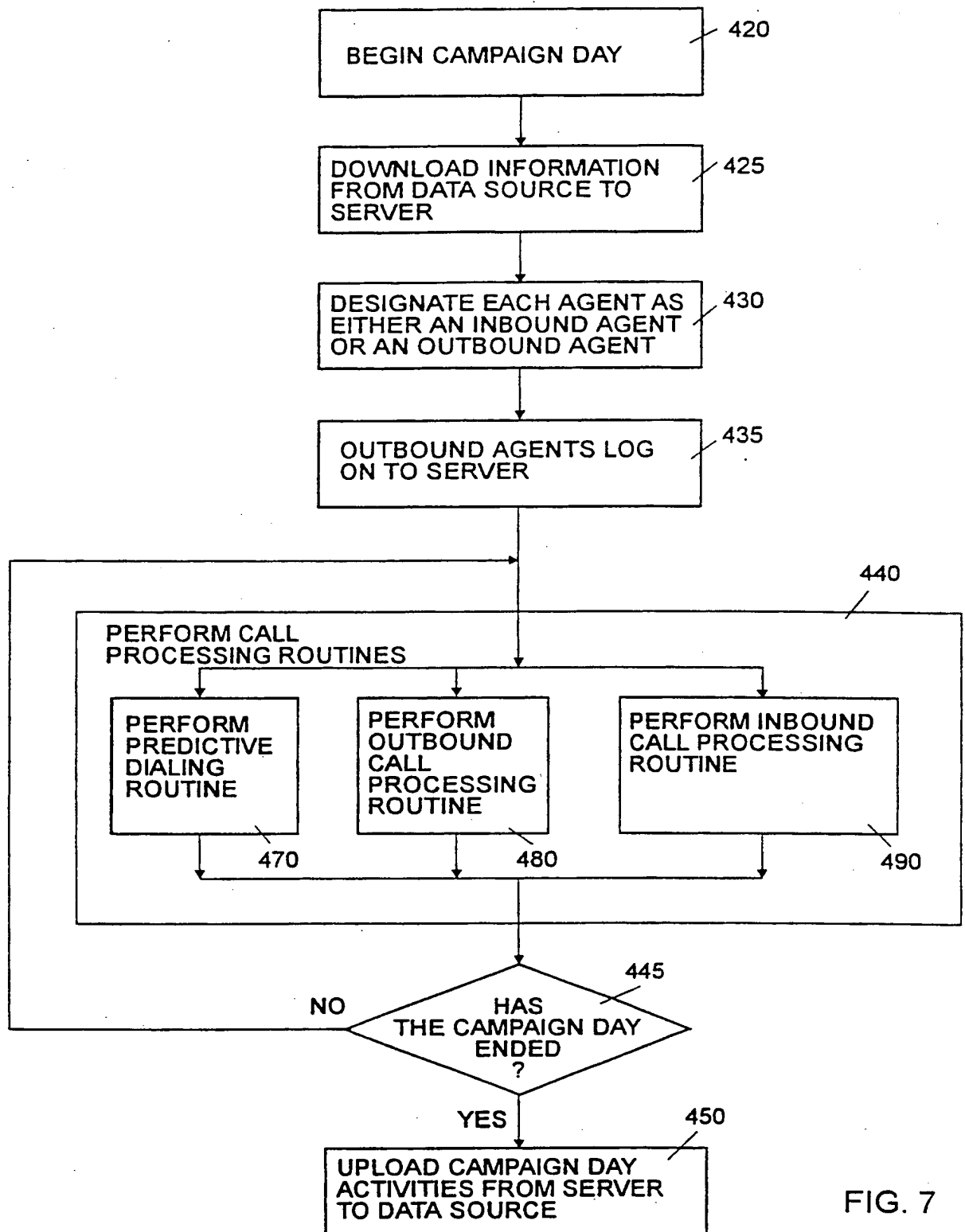


FIG. 7

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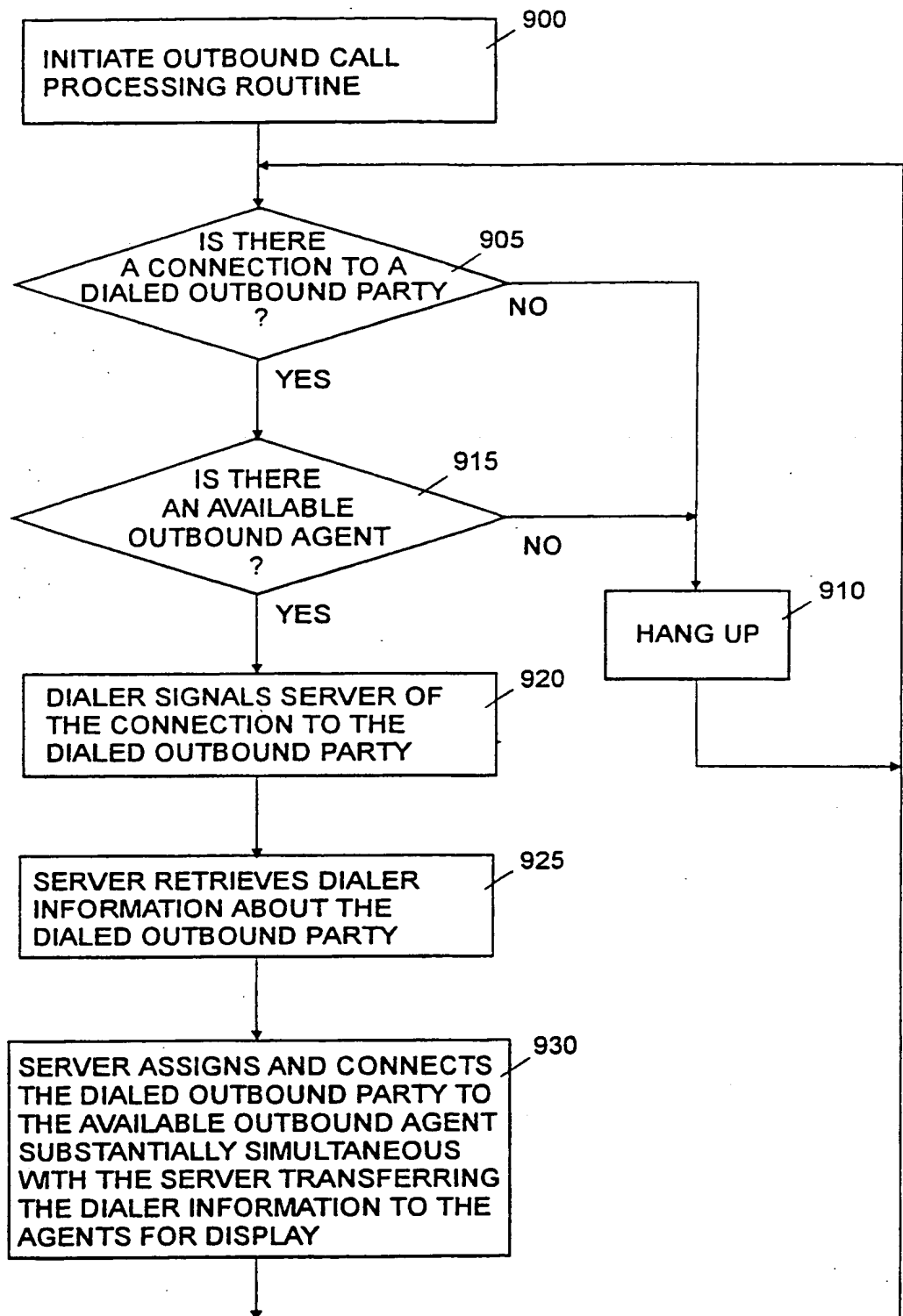
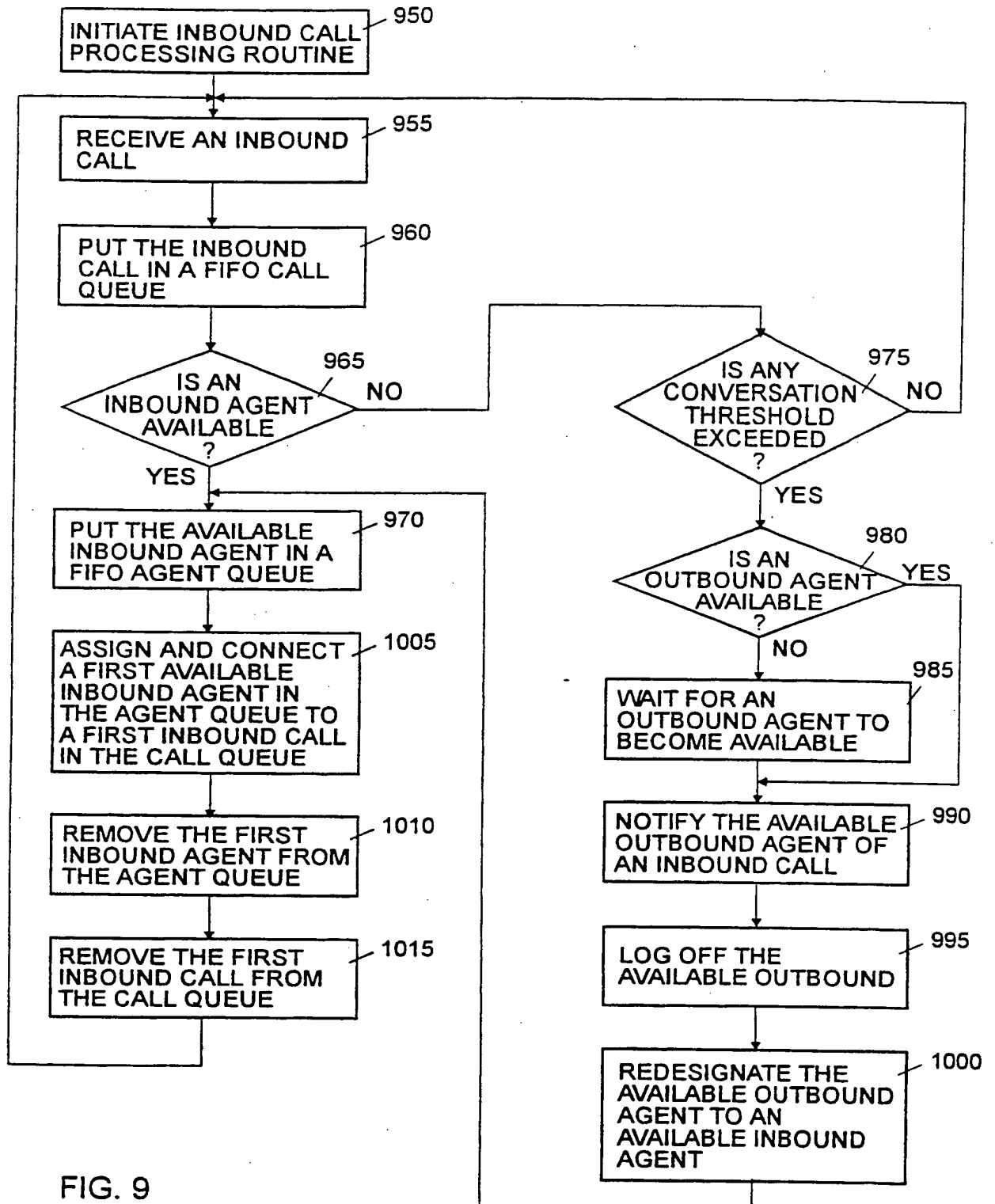


FIG. 8

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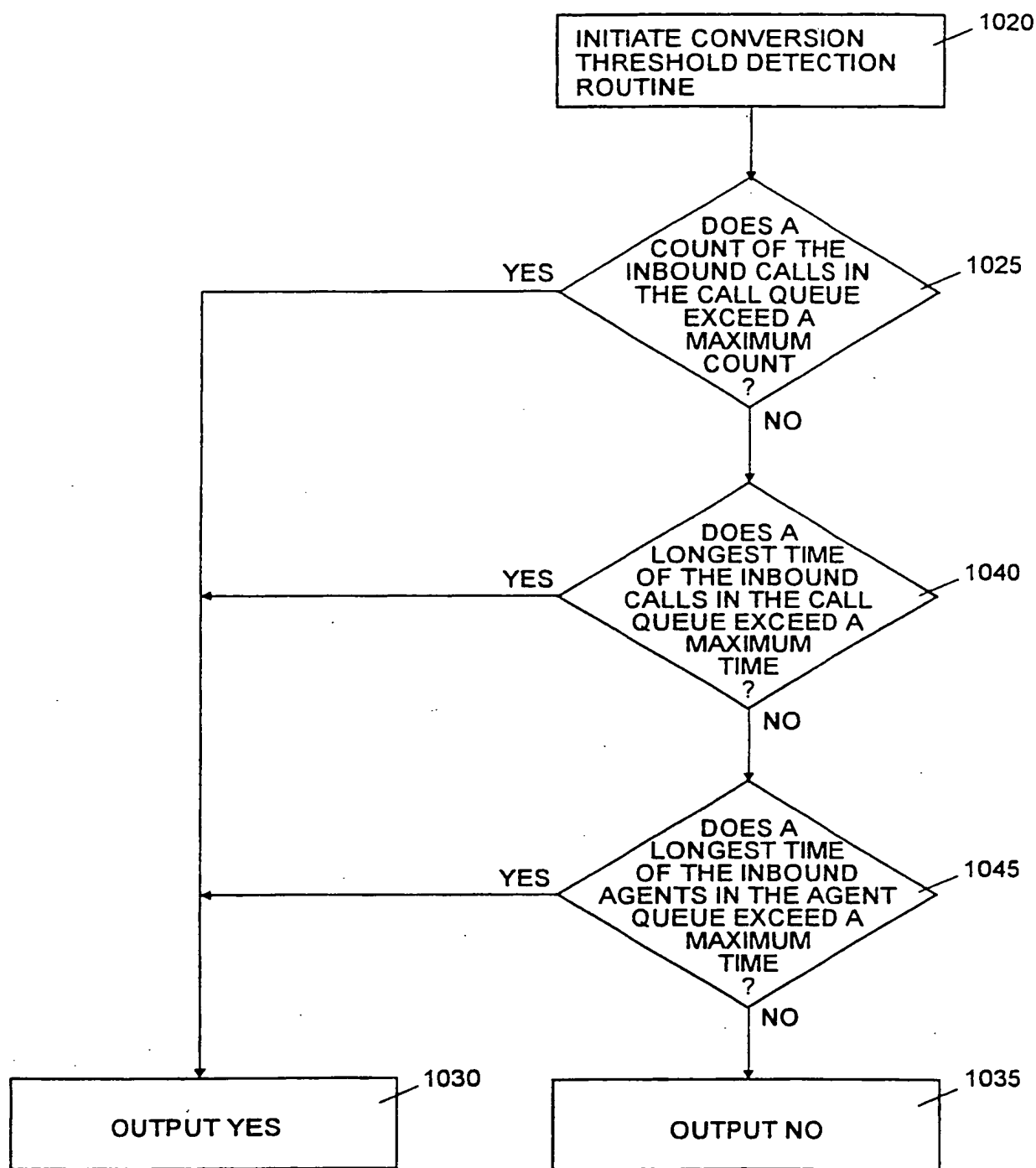


FIG. 10

CAMPAIGN PARAMETER MENU

CAMPAIGN NUMBER : 01	PREVIEW DIALING ENABLED (Y/N) : N
HOLD QUEUES ENABLED (Y/N) : N	TARGET CUSTOMER WAIT TIME : 02:00
RECORDER ID NUMBER : 00	MAXIMUM PERCENT ABANDONED CALLS : 50
MINIMUM AGENTS FOR DIAL-AHEAD : 06	AVERAGE AGENT WAIT TIME : 06
MAXIMUM RE-DIALS : 03	BUSY RESCHEDULE TIME : 00:15
NO-CONNECT RESCHEDULE TIME : 00:40	NO-AGENT RESCHEDULE TIME : 01:00
RING-NO-ANSWER RESCHEDULE TIME : 04:00	PASS OPERATOR INTERCEPT (Y/N) : Y
	PASS ANSWERING MACHINE (Y/N) : Y

CAMPAIGN DIAL SELECTION

[illegible]

F1-EXIT	F2-SAVE	F3-DEFAULT DIAL SELECTION	F4-TOP HALF	F5-BOTTOM HALF
---------	---------	---------------------------	-------------	----------------

PLEASE ENTER IN A CAMPAIGN NUMBER FROM 1 TO 14.

FIG. 11

AGENT SCHEDULING

AGENT PROFILE MENU		
ADD	DELETE	EDIT LIST
<div style="display: flex; justify-content: space-between;"> <div> AGENT NAME : ADDRESS : HOME PHONE : EMERGENCY PHONE/NAME : ID NUMBER : EXTENSION : PERFORMANCE RATING : CAMPAIGN ID : ACD GROUP : TELERECRUITER CODE : SPECIALTY : AGENT STATUS : </div> <div style="text-align: right;"> F1 - EXIT </div> </div>		

U - UPDATE
? - HELP

F1 - EXIT

FIG. 12

DYNAMIC SCREEN PROFILE MENU

(G)ROUP

1 2 3 4 5 6 7 8 9 10

1	2	3	4	5	6	8	10
20 21 24 35 36 37							

(A)LARM THRESHOLDS

GROUP : 1 WAIT 4 LONGEST 5 AGENTS 150

F1 - EXIT

U-UPDATE

E-ERASE ? - HELP

FIG. 13



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

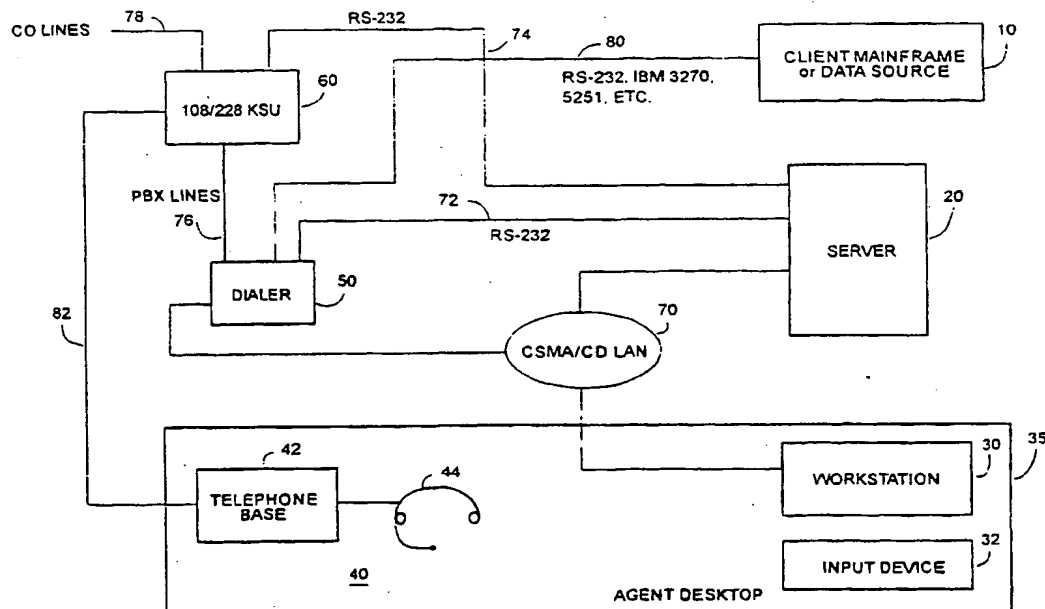
(51) International Patent Classification ⁶ : H04M 3/50, 3/46, 3/36		A3	(11) International Publication Number: WO 95/08236
			(43) International Publication Date: 23 March 1995 (23.03.95)
(21) International Application Number: PCT/US94/10516		(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, ES, FI, GB, GE, HU, JP, KE, KG, KP, KR, KZ, LK, LT, LU, LV, MD, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD).	
(22) International Filing Date: 16 September 1994 (16.09.94)			
(30) Priority Data: 08/123,309 17 September 1993 (17.09.93) US			
(71) Applicant (for all designated States except US): EXECUTONE INFORMATION SYSTEMS, INC. [US/US]; 478 Wheelers Farms Road, Milford, CT 06460 (US).		Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>	
(72) Inventors; and (75) Inventors/Applicants (for US only): RAMOT, Danny [IL/US]; 191 Lamplighter Lane, Fairfield, CT 06430 (US). BLAMEY, Jeffrey, L. [US/US]; 33 David Drive, Wallingford, CT 06492 (US).		(88) Date of publication of the international search report: 26 May 1995 (26.05.95)	
(74) Agents: BARRESE, Rocco, S. et al.; Dilworth & Barrese, 333 Earle Ovington Boulevard, Uniondale, NY 11553 (US).			

(54) Title: TELEPHONE CALL CENTER

(57) Abstract

A telephone system provides dynamic inbound/outbound call management for a telemarketing campaign to automatically initiate outbound telephone calls for outbound agents, with outbound agents redesignated as inbound agents to answer inbound calls as needed according to at least one threshold of number or duration of waiting calls or number or duration of waiting inbound agents. Each agent's work area (35) includes a telephone station (40) having a display (30) and an input device (32). The telephone stations (40) are coupled to a server (20) via a network, and the telephone system includes appointment and calendar functions with pop-up menus.

The server (20) is also coupled to an automatic dialer (50) and to a private branch exchange (60). When the server (20) assigns an outbound call to an outbound agent, the server sends information about the party called to the outbound agent's telephone station for display simultaneous with connecting the called party to the outbound agent. The telephone system allows each agent to control all telephone functions through the telephone station using the display (30) and input device (32). Each agent may dial and control additional calls using the input device (32), including central office calls, intercom calls and paging. As each outbound call is initiated or completed, system parameters are adjusted to maintain a predetermined minimum number of busy outbound agents. The adjustments also maintain the percentage of unattended outbound calls for which no outbound agent is available.



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INTERNATIONAL SEARCH REPORT

Int. Application No.
PCT/US 94/10516

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 H04M3/50 H04M3/46 H04M3/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 H04M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 460 816 (INVENTIONS) 11 December 1991	1,4-6
Y	see column 1, line 3 - column 4, line 29	3,7-15
Y,L, P	US,A,5 341 412 (RAMOT ET AL) 23 August 1994 CITED IN THE APPLICATION- DOUBTS ABOUT PRIORITY see column 6, line 58 - column 7, line 15	3,7-15
X	EP,A,0 551 715 (INTERVOICE) 21 July 1993 see column 3, line 13 - column 5, line 10	1,4-6
P,A	WO,A,94 09585 (DIGITAL SYSTEMS INT.) 28 April 1994 see page 2, line 18 - page 5, line 37 -/--	1,3-6

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

9 January 1995

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT

Int. Application No.
PCT/US 94/10516

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US,A,4 881 261 (OLIPHANT ET AL) 14 November 1989 ---	
A	US,A,5 210 789 (JEFFUS ET AL) 11 May 1993 see column 5, line 6 - line 28 see column 20, line 57 - column 21, line 2 ---	3,7
A	AT & T TECHNOLOGY, vol.2, no.3, 1987, SHORT HILLS, NEW JERSEY US pages 48 - 55 C.E.YATES 'TELEMARKETING AND TECHNOLOGY: PERFECT BUSINESS PARTNERS' see page 53, left column, line 16 - middle column, line 10 ---	3,7
A	US,A,5 113 380 (LEVINE) 12 May 1992 -----	

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US 94/10516

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. Claims: 1, 3-15
2. Claims: 2

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT

Information on patent family members

Int onal Application No

PCT/US 94/10516

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0460816	11-12-91	US-A- 5214688 AU-B- 636978 AU-A- 7642091 CA-A- 2041882 JP-A- 6217015	25-05-93 13-05-93 12-12-91 06-12-91 05-08-94
US-A-5341412	23-08-94	NONE	
EP-A-0551715	21-07-93	US-A- 5247569	21-09-93
WO-A-9409585	28-04-94	AU-B- 4280793	09-05-94
US-A-4881261	14-11-89	NONE	
US-A-5210789	11-05-93	NONE	
US-A-5113380	12-05-92	US-A- 5289531	22-02-94